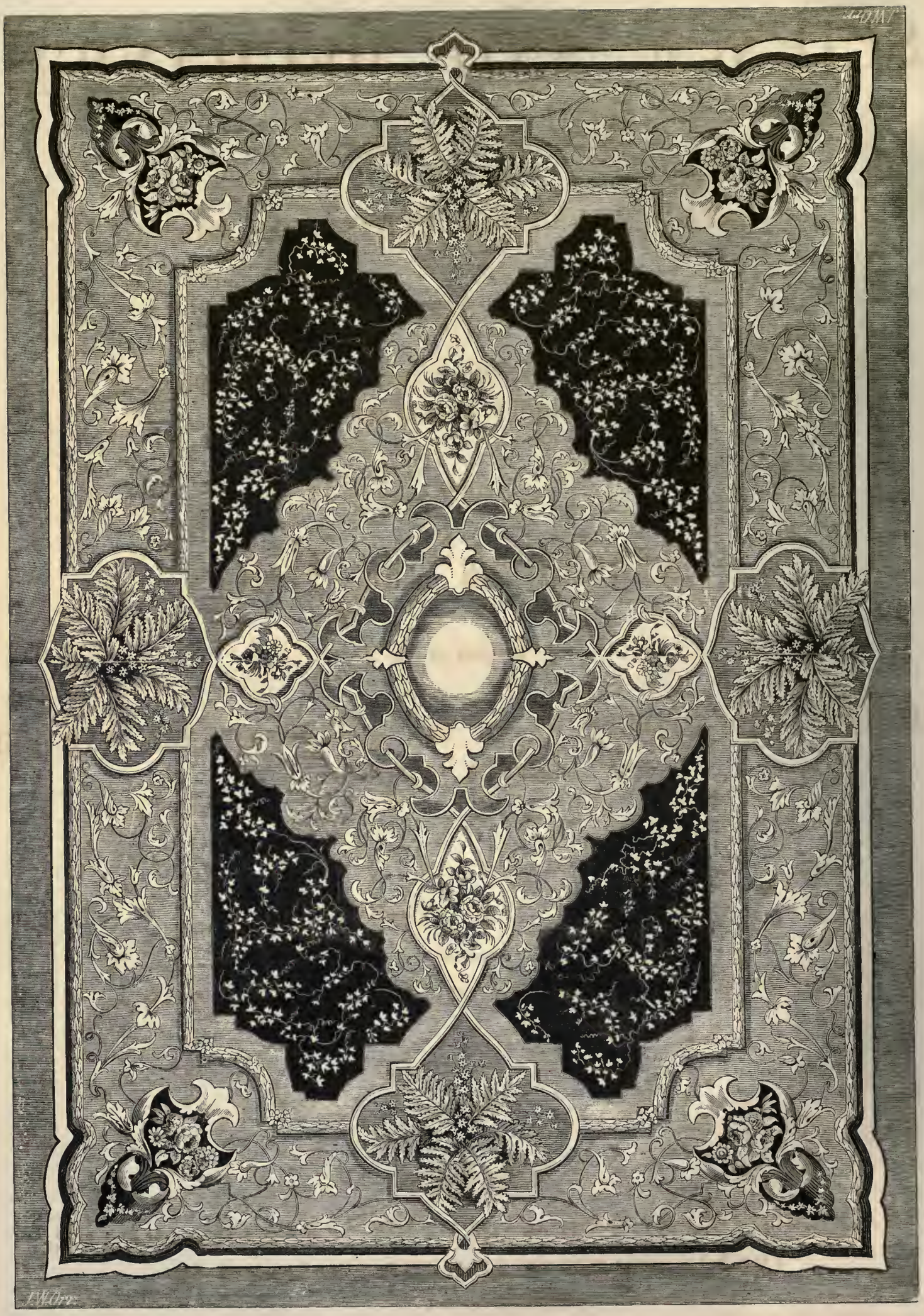
SCIENCE AND MECHANISM



PATENT AXMINSTER CARPET. TEMPLETON & CO., GLASGOW.

SCIENCE AND MECHANISM:

ILLUSTRATED BY EXAMPLES

IN THE NEW YORK EXHIBITION, 1853–4.

INCLUDING

EXTENDED DESCRIPTIONS OF THE MOST IMPORTANT CONTRIBUTIONS IN THE VARIOUS DEPARTMENTS,

WITH

Annotations and Notes

RELATIVE TO THE

PROGRESS AND PRESENT STATE OF APPLIED SCIENCE, AND THE USEFUL ARTS.

EDITED BY C. R. GOODRICH, ESQ.,

AIDED BY

PROFESSORS HALL, SILLIMAN, AND OTHER SCIENTIFIC AND PRACTICAL MEN.

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M.DCCC.LIV.

PREFACE.

The Annotated Catalogue of the New York Exhibition contains a list, usually descriptive, of the articles exhibited in each class, with such brief notes as were thought necessary to explain the nature and origin of particular articles, or the processes involved in their manufacture. The general plan and the classification of the official Annotated Catalogue of the London Exhibition has been followed in this, with such deviations as were found convenient and useful. Under each class, the contributions of the several countries are arranged in a fixed order, which is preserved throughout the Catalogue. The exhibitors are numbered in uninterrupted succession in each class; articles of a particular kind may be found by referring to the synopsis of classification prefixed to the body of the work.

The compilation of the Annotated Catalogue was not begun until towards the close of the year 1853, when the editor was requested to undertake its preparation. The Commissioners of the London Exhibition had required every applicant to furnish, before space was assigned to him, a detailed description of the articles he proposed to exhibit; but this precaution having been neglected in regard to the New York Exhibition, no materials existed from which the Catalogue could be compiled. To supply this deficiency, circulars containing minute specifications, as to the information required, were immediately prepared and despatched to the majority of American, and to the resident agents of foreign exhibitors. With few exceptions the answers returned were so vague and imperfect as to be useless; and in a great many instances no notice was taken of the circulars. The necessary statistics, &c., being thus withheld by the apathy of exhibitors, the editor was obliged to pass over several subjects which might have been the occasion of interesting annotations.

The Catalogue contains but a limited number of engravings. Exhibitors were allowed to insert, at their own expense, such illustrations of their articles as might be approved by the editor; very few, however, of those who applied, availed themselves of this privilege after ascertaining the expense of the engravings. Illustrations of all the most valuable and beautiful objects in the Exhibition having been already published in the World of Art and Industry, or Illustrated Record of the Exhibition, it was not thought proper to repeat them in the Catalogue, the companion volume of that work. For the same reason the subjects treated in the essays of the Record are not discussed in the Catalogue, but frequent references are made to them and to the illustrations. Each of these works, the Record and the Catalogue, is the natural complement of the other; and together they form a memorial, which, it is hoped, will not be thought unworthy of the event it commemorates.

C. R. G.

New York, *March*, 1853.

TABLE OF CONTENTS.

The following Gentlemen contributed more or less to the preparation of this Volume:—

H. S. BABBITT, Esq.
Dr. F. A. GENTH.
CHARLES R. GOODRICH, Esq.
Prof. GEORGE W. GREENE.
WILLIAM K. HALL, Esq.
Prof. JAMES HALL.
Lieut. E. B. HUNT, U. S. A.
Dr. SAMUEL KNEELAND, Jr.
Prof. B. SILLIMAN, Jr.
SAMUEL WEBBER, Esq.
DAVID A. WELLS, Esq.
Dr. CHARLES M. WETHERILL.
Prof. JAMES D. DANA.
GRANT WHITE, Esq.

HENRY WURTZ, Esq.

SYNOPSIS OF THE CLASSES OF THE CATALOGUE.

SECTION I.—RAW MATERIALS.

Class I.

Minerals and Mining Products.

A. Minerals of economical value.
1. Carbonaceous Minerals—Coal, Lignite, Graphite, &c.
2. Ferriferous Minerals—Magnetic, Specular, Limonite, &c.
3. Ores of Common Metals—Manganese, Zinc, Copper, Lead, Tin, Mercury, &c.
4. Precious Metals and their Ores.
5. Building and other Architectural Materials.
6. Minerals otherwise useful—Salt, Gypsum, Clay, &c.

B. Minerals of Mineralogical and Chemical Interest.

Class II.

Chemical and Pharmaceutical Processes and Products.

Class III.

Substances used as Food.

A. Vegetable Substances.
1. Agricultural Produce—Cereals, Pulses, Seeds, &c.
2. Dried Fruits, Nuts, &c.
3. Substances used in the Preparation of Drinks.
4. Fermented Liquors, Wines, and Intoxicating Drugs.
5. Spices and Condiments.
6. Starch Series used as Food.
7. Sugar Series.

B. Animal Substances.
1. Preserved Meats, Caviare, Gelatine, Isinglass, Honey, &c.

Class IV.

Substances used in Manufactures.

A. Of Vegetable origin.
1. Gum and Rosin Series.
2. Volatile and Fixed Oils.
3. Dyes and Colors.
4. Substances used in Tanning.
5. Fibrous Substances—Materials for Cordage.
6. Cellular Substances—Corks, &c.
7. Timber—Ornamental and Fancy Woods.
8. Miscellaneous Substances.

Of Animal origin.
1. For Textile Fabrics and Clothing.
2. For Ornamental or Domestic uses—Ivory, Tortoise-shell, &c.
3. Agents in Manufactures—Glue, Gelatine, Ivory Black, &c.
4. For the production of Chemical Substances.
5. Dyes and Pigments.

SECTION II.—MACHINERY.

Class V.

Machines for direct use.
1. Steam Engines and Boilers, Water and Wind Mills, and other Prime Movers.
2. Separate Parts of Machines.
3. Pneumatic Machines.
4. Hydraulic Machines, Cranes, &c.
5. Locomotive and Railway Carriages.
6. Railway Machinery and Track.
7. Weighing, Measuring, and Registering Machines, for commercial use.
8. Carriages generally—not including those for railway and agricultural use.

Class VI.

Manufacturing Machines and Tools.
1. For manufacturing Spun, Woven, Felted, or Laid Fabrics.
2. For manufacturing Metals.
3. For manufacturing Mineral Substances.
4. For manufacturing Vegetable Substances.
5. For manufacturing Animal Substances.
6. Apparatus for Brewing, Distilling, &c.

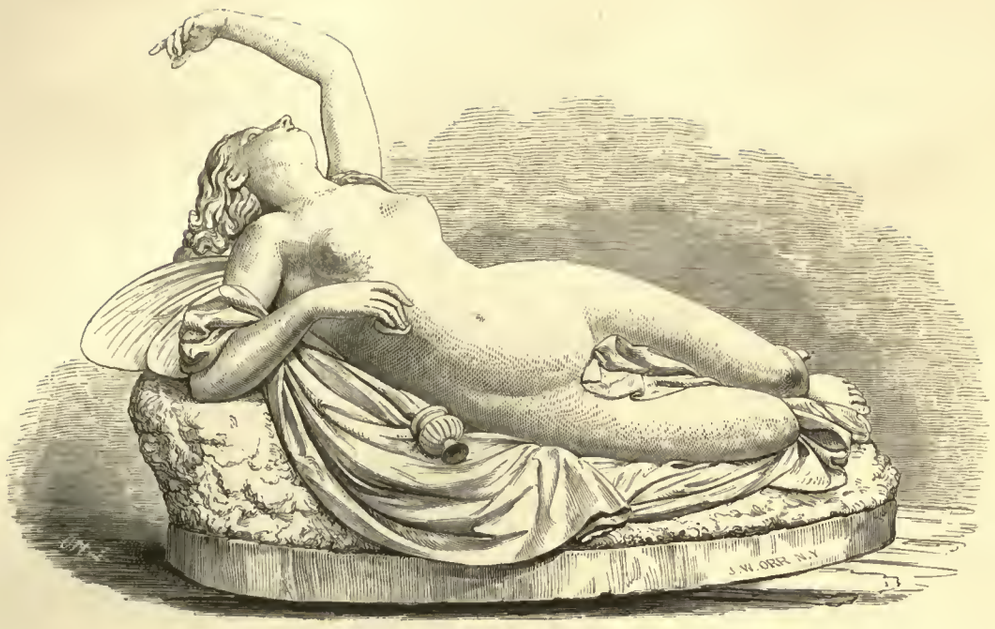
Class VII.

Civil Engineering and Architecture.
1. Foundations and Building contrivances connected with Hydraulic Works.
2. Scaffolding and Centering.
3. Bridges, Tunnels, &c.
4. Dock, Harbor, River, and Canal Works.
5. Lighthouses and Beacons.
6. Roofs, &c.
7. Waterworks and Engineering—contrivances connected therewith.
8. Gas Works and their Apparatus.
9. Sewers, Drains, Pavements, &c.
10. Warming and Ventilating contrivances.
11. Miscellaneous.

Class VIII.

Naval Architecture, Ordnance, Armor, &c.
1. Models of Commercial Vessels.
2. Models of War Vessels.
3. Models of Steam Vessels.
4. Models of Yachts, Boats, &c.
5. Rigging, Anchors, Capstans, &c.
6. Army Clothing and Accouterments.
7. Camp Equipage, Tents, Marquees, &c.

FOUNTAIN—BRONZE. LEROLLES, FRANCE.



PSYCHE. C. M. FRAIKEN, BELGIUM.

BUST OF JENNY LIND—MARBLE. DURHAM, ENGLAND.

CANDELABRUM—ALABASTER. ITALY.

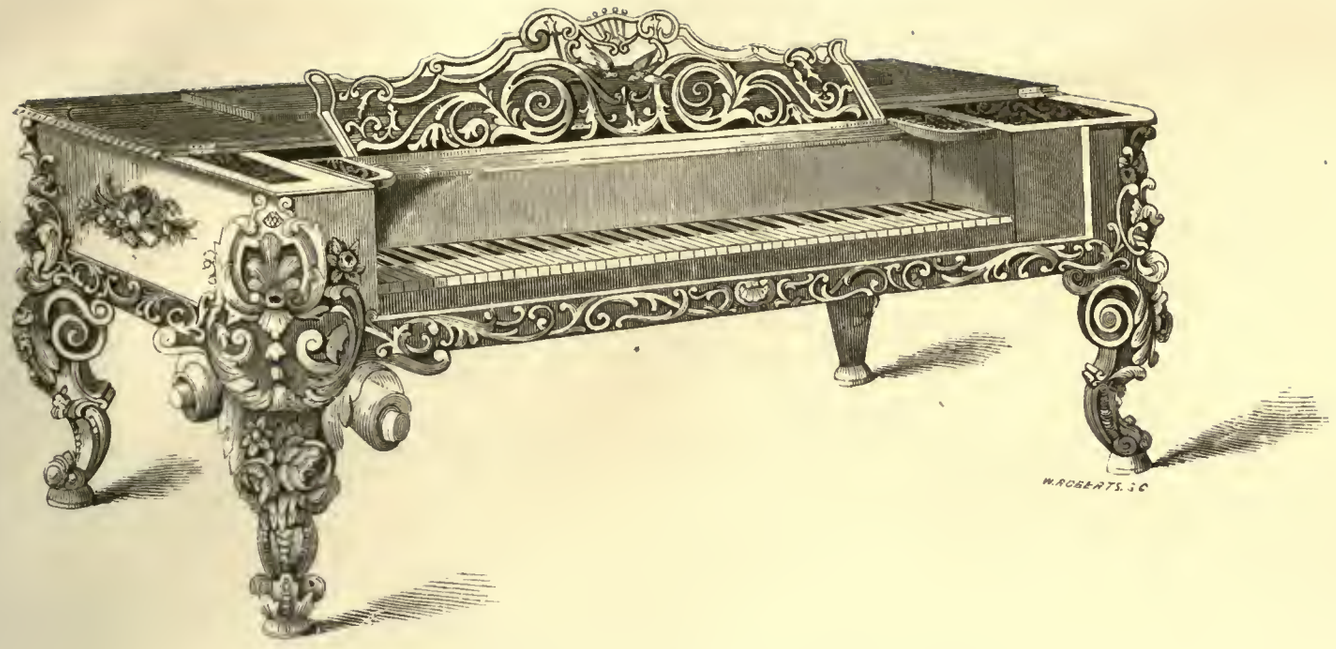
MANTEL-PIECE—WHITE MARBLE. LEVY, NEW YORK.

MANTEL-PIECE—WHITE MARBLE. LEVY, NEW YORK.

MIRROR. NEWLAND & CO., PHILADELPHIA.

CHANDELIER. CORNELIUS & CO., PHILADELPHIA.

BILLIARD-TABLE—ROSEWOOD. A. DASSFORD, NEW YORK.



ROSEWOOD PIANO FORTE. GEO. HEWS, BOSTON.

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SECTION I. CLASS I.

MINERAL AND MINING PRODUCTS.

The collection of the materials for Class I., was undertaken about the middle of March, when it was still the intention that the Exhibition should be opened on the first of May; owing, however, to delay in completing that part of the building where the cabinet of minerals was placed, the collection was not opened to the public until September, and it was then decided to adopt a geographical arrangement of the collections as being the most practicable under the circumstances. This arrangement was preserved in the hand catalogue, but for obvious reasons is not followed in the present Annotated Catalogue. In order to secure any measure of success in forming a mineral collection in such a brief space of time (about four months), it became requisite to enlist the services of those who were able to visit in person the various mineral regions, from which it was designed to collect specimens and information. It is but just to mention the gentlemen who kindly undertook this duty.

William Phipps Blake, Ph. B., of New York, visited the iron regions of Lake Champlain and the phosphate deposits of the same district; the zinc mines of New Jersey and of Bethlehem, Penn.; the chrome and copper works at Baltimore, and a portion of the gold regions of Virginia. Subsequently Mr. Blake made a special journey to the copper regions of North Carolina, and that of the Haiwasse in Tennessee.

George J. Brush, Ph. B., in company with the director, visited the lead and copper mines of Chester and Montgomery counties in Pennsylvania, and selected from the cabinet of Mr. Wheatley the beautiful suite of specimens, which formed so conspicuous an ornament in the Exhibition. From the cabinet of John Ehlers, Esq., of Hoboken, Mr. Brush selected a very full and instructive suite of Mexican Silver ores, collected by Mr. E., during his long residence in that country.

Prof. W. J. Clarke, of Amherst, visited numerous mines and owners in Massachusetts, Rhode Island, and Vermont.

Dr. F. A. Genth, of Philadelphia, extended his services for the Association, over a very wide range of country, and with remarkable success, visiting the iron and lead regions of Northern New York, the copper, iron, cobalt and chrome regions of Maryland, the gold and copper districts of Virginia and North Carolina. Dr. Genth also induced a number of private collectors and proprietors of mines to loan to the Association such specimens as he selected from their cabinets, and often such as could be procured in no other way.

Prof. O. P. Hubbard, M. D., of Dartmouth College, collected and forwarded the most interesting minerals from the State of New Hampshire.

Mr. Ludwig Stadtmuller, of New Haven, visited the iron furnaces of Connecticut, adjacent to New York, the copper, lead and cobalt mines of Connecticut, and of Northampton in Massachusetts, selecting and forwarding specimens from numerous proprietors and private collectors. He also visited the copper region of the Blue Ridge in Virginia, at Manasses Gap.

Dr. Chas. M. Wetherill, made an extensive exploration of the iron and coal regions of Pennsylvania, confining his labors chiefly (from want of sufficient time) to the eastern districts of this most productive State. His collection of the ores, coals, and furnace products, of the fifty furnaces visited in this exploration, formed a most interesting and conspicuous feature in the cabinet of the Exhibition. While the valuable details gathered on this occasion, are embodied in the useful and instructive report of Dr. W., which appears in its appropriate place in the following pages.

Special acknowledgment is due, also, to the numerous private collectors, who kindly permitted selections to be made of many of the rarest and most valuable specimens in their cabinets. By this means, many localities were represented of which no mention was to be found in the geographical arrangement. Conspicuous among these were—the contributions of Jos. A. and J. Randolph Clay, Esqs., Wm. J. Vaux, and Dr. F. A. Genth, of Philadelphia; Mr. L. Wilder, of Hoosick Falls, N. Y.; Dr. Conkey, of Antwerp, N. Y.; Chas. M. Wheatley, Esq., of Phœnixville, Penn.; Lieut. Gilliss, the United States Government, and the Smithsonian Institution, at Washington; John Ehlers, Esq., of Hoboken; Adams & Co., of New York; Mr. Roswell King, of N. C.; and the cabinets of Union and of Hamilton Colleges, in New York.

The States of Missouri and Michigan, aided the exhibition of their mineral products by special grants of money to form collections from their most important mining districts. It is believed that these are the only States whose governments made such appropriations.

This collection was necessarily deficient in many important particulars, but it is believed that it was as complete as it was possible to make it with the time and means at the disposition of the director. Those who are at all conversant with the delay and difficulty experienced in forming a private mineralogical cabinet, will make reasonable allowance for all deficiencies. Is is to be hoped that the manifest advantages growing out of such a collection, even aside from its general scientific interest, will induce the attempt at no distant day to form a cabinet which shall be a full mineral and mining map of the United States.

A. On the Geological relations of American Rocks and Minerals.

The physical character, and topographical features of a country, universally impress certain characters upon the industrial pursuits in its different regions; determining some districts as agricultural, and others as manufacturing or mining. The original causes producing these differences, rest in a great measure upon the geological structure of the country. In the United States, every physical arrangement seems ordered upon a scale of vast magnitude. Immense areas of pre-eminent agricultural capability, with scarcely any mineral resources except limestone and ordinary building materials, with soil of unexceeded fertility, determine the character and pursuits of men over thousands of square miles. Other areas of great extent combine certain mineral resources with a moderately good soil, and thus support a population divided between the manufacturing and agricultural interests. Again other districts are de-

voted exclusively to mining and manufacturing, and rely for food upon the agricultural regions. These lines though well marked in nature, are not yet as strongly defined in the pursuits of the people as they will be in future times; and it is by this knowledge of the physical constitution of the country that we may know what portions are adapted to certain pursuits, and predict what will be the character and avocations of their future inhabitants. Certain areas containing valuable mineral products exist upon the confines of civilization, and others are still almost inaccessible from their remote position. These, however, are gradually, and in many cases rapidly being added to the available resources of the nation, and within a few years many of these points will be the midst of a numerous and wealthy population.

In the early settlement of a country, the lands of highest agricultural value will necessarily be first sought; and therefore, while vast tracts of great agricultural capacity remain still sparsely populated, it cannot be expected that mining and manufacturing enterprises will be carried on to the extent required by the wants of the community, or warranted by its resources. But with the increasing population and wealth, all branches of national industry are rapidly expanding. The mining operations which are yet in their infancy, are continually modified by discoveries of new mineral resources, from time to time, made even in the best known regions. Until recently, mining enterprises may be said to have been undertaken more as chance speculations than with a systematic endeavor to develope the mineral resources of the country; and, consequently, extensive regions where mineral wealth may naturally be expected, remain comparatively unknown, beyond their general geological features.

In view of this changing and progressive condition, a Report on the industrial resources of this country can make only approximation to their actual condition. Geological explorations have shown us the areas of future mining operations in the United States; but the present condition of these, gives no adequate idea of the future magnitude of this department of national industry; and observation of the rapid advancement of these interests, proves abundantly the immense importance of our inexhaustible mineral resources.

The principal physical and geological features of the Eastern United States, or that portion of the country on the east of the Rocky Mountains, may be presented in a few brief paragraphs. Entering the United States from New Brunswick and Canada East, a mountainous belt of country extends thence in a south-westerly direction, nearly to the Gulf of Mexico. It has a general parallelism with, and gives form and outline to the Atlantic coast of the United States. This mountain range, rising in places to the height of six thousand feet above the level of the sea, is represented in the mountains of Maine; the White Mountains of New Hampshire; the Green Mountains lying between the Connecticut valley on one side and the valleys of Lake Champlain and the Hudson on the other; the Highlands upon the Hudson River; and the Alleghany and other ridges of the Appalachian chain farther to the south, which finally terminate in the State of Alabama.

On the north of the St. Lawrence, we find a chain of mountains lying nearly parallel to the course of the river, as far as the outlet of Lake Ontario. Thence in a more westerly direction the range extends, with some interruptions and deviations, nearly to the Rocky Mountains. This northern range of mountains, although mainly beyond the limits of the United States, nevertheless forms the northern boundary of that great basin which we are about to describe.

The Rocky Mountain range crosses the territory of the United States in a generally north and south direction, and reaches the southern limit of the United States in about the one hundredth degree of west longitude.

The country limited by these three mountain ranges, forms therefore an immense plain or basin, having its principal opening to the ocean southward by the great valley of the Mississippi into the Gulf of Mexico. On the northeast the communication is mainly by the valley of the St. Lawrence: while the Hudson River, together with the artificial communications through the Mohawk valley, make the second most important outlet in this direction. This great plain or basin, bounded as has been just described, is mostly occupied by rocks of sedimentary origin, which are still scarcely changed from their normal condition, and retain a nearly horizontal position. The inequalities of surface are almost entirely due to denudation, the action of water, or other causes which have excavated deep and broad channels. Extending westward from the eastern range of mountains already described, and forming in a considerable degree the western slopes of the range itself, we find a wide area of the older formations from the lower fossiliferous rocks to the coal, inclusive, extending in almost unbroken succession from the valley of the Hudson to beyond Council Bluffs on the Missouri River, over twenty-four degrees of longitude. Farther south it becomes narrower, as the Appalachian chain trends to the westward; and it reaches its southern termination, as a continuous area, in the northern part of Alabama. From north to south these formations extend over fifteen degrees of latitude. Of this great extent nearly one half is occupied by the coal measures of the carboniferous period.

On the east of the Appalachian chain, the Cretaceous and Tertiary formations occupy a broad plateau along the Atlantic slope, and extend southward from New Jersey in a continuous and gradually expanding belt to the Gulf of Mexico. Thence westerly and south-westerly they spread to the farthest limits of the State of Texas. After passing to the south of the palaeozoic rocks in Alabama, this belt of cretaceous and tertiary, but more especially the former, trends northward, along the valley of the Mississippi, extending in that direction as far as the State of Illinois. Sweeping around the southern extremity of the older formations in Arkansas, they bend northward and form a broad expansion between the western limits of the older sedimentary strata and the Rocky Mountains.

Leaving out of view for the present the regions of California and Oregon, it is from within the limits here described, and from these geological formations, that the United States draws its industrial resources; and from this region both agricultural and mineral wealth are to be chiefly derived. All parts of this interior region are bound together and opened to each other and to the seaboard by natural navigable waters, or by railroads and canals; and while a large part of this great central portion of the United States has hitherto been appreciated mainly for its agricultural products, the coal and iron which abound in its extensive carboniferous districts are beginning to exert their immense influence upon the country.

From this hasty sketch of the great physical and geological features of the United States, it will readily be perceived that no just idea of the mineral resources of this country can be formed from the collections brought together in any exhibition. It will be rather from observing the characteristic geological features which determine the occurrence of certain mineral resources, and the extent of these formations within the limits of the States, that some just idea can be formed.

It seems necessary, therefore, that a special review of the mineral productions of the United States, as exhibited in the Crystal Palace, should be preceded by a short sketch of the geological formations from which they are derived, both for the purpose of enabling us, in the first place, to refer each of these productions to its true geological period and place in the series; and also to enable us to point out where great deficiencies exist, or rather to those formations or areas which are but partially, or imperfectly represented in these collections. The principal geological formations may in a general manner be designated as follows: beginning with those recognized as the oldest in point of time.

Gneissic and granitic, or older metamorphic rocks.

Newer crystalline or metamorphic rocks; which are generally recognized as of the palaeozoic age.

Lower Silurian rocks.

Upper Silurian rocks.

Devonian, or old red sandstone formation.

Sub-carboniferous rocks, including carboniferous limestone.

Coal measures.

Newer Red Sandstone. (New Red Sandstone of Europe, Triasic.)

Oolitic or Liassic formations.

Cretaceous formations.

Tertiary formations.

Quaternary formations, or drift and alluvial.

Trappean rocks of various ages.

GNEISSIC AND GRANITIC ROCKS OF THE OLDER METAMORPHIC FORMATIONS.

These formations, consisting in a great measure of sienitic gneiss, granite, hornblende, mica and talcose schists, with highly crystalline limestones, and inclosing many crystalline minerals, occupy extensive areas in some parts of the United States. These rocks preserve evidences of stratification so distinct, as to warrant the opinion that they were originally sedimentary strata which have been metamorphosed by igneous agencies. Among the evidences of the causes of the change, we find these rocks penetrated and disturbed by large intrusive masses of crystalline granites and other rocks generally regarded as of igneous origin. The whole system is likewise traversed by dykes of trap, sometimes of great extent. Nor is it always easy to decide where the metamorphic strata end, or the crystalline masses of igneous origin commence; the stratification not unfrequently becomes obscure or obliterated, and the entire mass graduates into a granitic or sienitic structure.

These rocks compose for the most part the chain of mountains on the north of the St. Lawrence River, and extending parallel with it as far as the Thousand Islands.

In the northern part of New York the rocks of this formation rise into mountains five thousand feet in height, but this is much above their usual elevation.

The older metamorphic rocks, extending through Canada, on the north of Lake Huron, pursue the same westerly course, and occur in the same parallel on the southwest side of Lake Superior, reaching almost uninterruptedly from Carp River to Point Abbaye. Thence westerly and southwesterly from this coast line, the formation gradually increases in width to the central part of the State of Wisconsin, where its southern limit reaches to about the parallel of the outlet of Lake Winnebago. In this region the rocks of this age do not rise to any great elevation above the general surface of the surrounding country; but they produce numerous interruptions in the water-courses, giving rise to falls and rapids in the Wisconsin, the Black River, and the upper branches of the Chippewa River. This formation reaches the Mississippi River above the Falls of St. Anthony, and thence pursues a northwesterly course towards the Rocky Mountains.

In the State of Missouri there occurs a belt of metamorphic rocks of considerable extent, which, from their lithological character, their associated minerals, and the nature of the surrounding rocks, are known to be of this age. A similar belt occurs in Arkansas, having the same associations as that of Missouri. A belt of igneous and metamorphic rocks likewise occurs in Texas, probably of the same age, though their relations are not fully known.

It is not always easy to distinguish the formations of this age from those of the succeeding period; so nearly do they in some of their phases resemble each other. Certain mineral products however appear to accompany the one formation much more constantly than they do the other; but in the present state of our knowledge we have not the means of fully identifying the two formations by mineral products alone. It is therefore necessary to study them in their great physical features, and in their connection with the surrounding formations.

Economical Products of the Older Metamorphic Rocks.—The most important economical products of these formations, are the magnetic and specular oxydes of iron, which occur in immense quantities as beds or masses of each kind separately, or of the two combined. The abundance and wide distribution of these ores, associated with the older rocks, renders this formation of the highest interest in an economical point of view.

Copper, lead, and zinc ores occur in the same formation. Phosphate of lime is found both in crystallized and massive form; the latter in sufficient quantities to be of economical importance. Kaolin, from the decomposing feldspar, and feldspar, useful in the manufacture of different varieties of porcelain, are obtained in large quantities.

The building materials of this formation consist of gneiss, granite, and coarsely crystalline limestones, in some cases producing good marbles. Some of the slates contain sufficient silica to be used as hones or whet-stones. Plumbago occurs in considerable quantities in rocks of this period in the northern part of New York.

Among the beautiful crystallized minerals of the older metamorphic rocks, are: apatite, zircon, spinelle, sphene, augite, tourmaline, Labrador feldspar, &c.

NEWER METAMORPHIC ROCKS.

The term, newer metamorphic, is proposed for those crystalline and semi-crystalline formations which are known to be derived from the alteration, or metamorphism of strata newer than those constituting the older metamorphic formations previously described.

This class of rocks is of great extent in the United States; and has, like the preceding formation, been usually termed PRIMARY. The series consists of various slaty or schistose beds, as chlorite, talc, and mica schists, gneiss, hornblendic rocks of different characters, quartz rocks, granitic and sienitic masses, various crystalline limestones; together with numerous intermixtures of these and passages from one to another.

In this series we include all the indurated rocks of the New England States, with the exception of the red sandstone of the Connecticut River, and some areas of the coal measures which still retain their unaltered condition. Numerous observations, which have been continued through many years, have all united to prove that the various crystalline strata, between the Connecticut and Hudson River valleys, are the product of metamorphic action upon various slates, sandstones, and limestones of the series hereafter to be described as Silurian and perhaps Devonian, and which were deposited subsequent to the formation of the older metamorphic rocks.

The rocks upon the west side of the Connecticut River dip towards, and in part surround the coal fields of Rhode Island and Massachusetts; while farther north the crystalline rocks of New Hampshire and Maine hold the same relation to the coal fields of Nova Scotia and New Brunswick. In this direction we find a constantly ascending series as we approach the coal measures, and there is nowhere evidence that the rocks on the east side of the Connecticut River are older than those on the west; but, on the contrary, that they belong to the higher sub-divisions of the palaeozoic formations, and chiefly to the Devonian and Carboniferous systems. We are thus able in a very satisfactory manner to determine the age of this broad belt of metamorphic formations; while we omit for the present all consideration of the trap and porphyritic masses which at numerous points, and for a considerable extent, skirt the Atlantic coast on the north of Cape Cod.

The same belt of formations extends southerly through the southeastern part of New York, New Jersey, Pennsylvania, Maryland, Virginia, North and South Carolina, Georgia, and Alabama, forming the greater part of the belt of crystalline and semi-crystalline rocks of the Appalachian chain, which are bounded on the west by the unaltered ancient fossiliferous strata, into which they graduate.

The true method of studying these rocks is to commence from the western side. In the valley of the St. Lawrence, and thence by the Champlain and Hudson valleys, southerly in the direction of the Alleghany chain, we find a series of stratified beds from the oldest fossiliferous rock to the coal formation inclusive. Tracing these beds eastwardly or towards the mountain ranges, we find that the beds, at first nearly horizontal, gradually exhibit undulations, and that these increase in magnitude and abruptness until they form sharp anticlinal axes, and are even overturned and folded one upon the other in the very reverse of their original position.

These undulations, foldings and plications are accompanied by other changes. The slates and shales at first lose their slaty character, and are traversed by numerous short seams or joints, cutting them in almost every direction. Besides the joints in straight lines, there are numerous short curves and glazed surfaces which are likewise striated as if from motion among the parts of the mass. The next change, indicating a further degree of metamorphism, is observed in the presence of seams of calcareous spar, or silicious matter, which appears to have been segregated from the surrounding mass during this partial change.

Beds of argillaceous, or argillo-calcareous sandstones which accompany the shales, undergo other changes. They become more compact and tough than the same beds in their normal condition, and are found to contain numerous seams of calcareous spar, and sometimes slightly open joints lined with calc-spar and crystallized quartz. Some of these beds become penetrated with a net-work of quartz veins, which appear prominently on the surface, as the more destructible materials are worn away by the action of the weather. The more purely silicious sandstones become harder and closer in texture, often assuming the character of quartz rocks, and sometimes showing a development of micaceous laminae, not at all or but very partially visible in the same rock in its normal condition.

The limestones gradually change color, become penetrated by seams of calcareous spar, and the silicious matter is often segregated in net-like ramifications. The organic remains become obscure or are obliterated; the matter of the fossil assuming the same character as the rock, and becoming absorbed as it were by the surrounding mass. They are sometimes recognized by their more crystalline structure, and are visible upon weathered surfaces when they cannot be distinguished on the fresh fracture. Finally the shaly beds among the limestones become more distinct, the impure limestones exhibit micaceous seams or partings, and the whole mass becomes crystalline, assuming a gray, white, or variegated color. Even after the mass has become perfectly crystalline, and presents the fracture of the so-called primary limestones, the forms of organic bodies may still be detected upon their weathered surfaces, standing out in conspicuous relief; being preserved, either from their more perfectly crystalline structure, or from the presence of less soluble material.

Thus far it is easy for even the tyro in geology to trace the changes which supervene upon the strata, and the partial or occasional occurrence of organic remains. Beyond these limits the changes still go on. The slates proper gradually assume the aspect, condition, and quality of talcose and chloritic schists. In the coarser slates we find the development of mica, and the whole assumes the character of mica slates, thence naturally and gradually passing into gneiss. From a larger admixture of silicious matter, some of the slaty sandstones and conglomerates assume the character of hornblendic rocks; the sandstones become granular quartz rock and finally compact and crystalline quartz. The limestones, losing all traces of organic remains, become wholly crystalline. With the absence of fossils, we find various crystallized minerals which have become separated from the surrounding mass, or which have resulted from new combinations taking place among the elements of these bodies during the progress of the metamorphism.

Accompanying these lithological changes, are found equally great physical changes in the condition of the rocks. The foldings and plications of the beds, becoming more extensive, the rocky ranges are elevated into mountain masses or long lines of ridges constituting mountain chains. These, as already described, stretch along almost the whole extent of the United States from Canada to Alabama.

The crystalline rocks of New England, therefore, and the extension of the same formations to the southward, consist of the various rocks and groups yet to be described under the head of Silurian, Devonian, and Carboniferous systems. The various beds or groups of these systems are always to a great extent, and often entirely recognizable in their metamorphic and crystalline condition, even when not directly traceable as continuations from the unaltered beds themselves.

Such is the nature and origin of the great area of crystalline rocks in the Atlantic zone of the United States, the true key to the understanding of which lies in the study of the palaeozoic or older fossiliferous formations, which are spread out on the west of the crystalline deposits.

The Economical Products of the Newer Metamorphic Rocks.—Magnetic iron, chromic iron, and peroxide of iron, gold, the ores of tin, copper, lead, zinc, cobalt and nickel. Building stones of sienite, granite, porphyry, marble, &c. Flagging stones and roofing slates, from the semi-altered shales and shaly sandstones, from the quartz rocks, mica slate, &c. Millstones from the sienite: statuary marble, serpentine marble or verde antique, ornamental porphyry, mica. Quartz sand for glass-making, feldspar for porcelain and pottery.

CLASSIFICATION OF THE OLDER SEDIMENTARY OR PALAEOZOIC ROCKS.

The series of sedimentary strata which lie above the older metamorphic rocks, and extend upward so far as to include the coal measures, have within the last fifteen years been sub-divided into the Silurian, Devonian, and Carboniferous groups. The two former include what were once known as Transition rocks, and the latter retains essentially its original signification. The whole are known as *Palaeozoic rocks.* They have a greater extent upon the North American continent than elsewhere in the world. Of all the geological formations, the most important to the progress of civilization and national wealth is the last of these sub-divisions, namely, the carboniferous, or coal formation.

LOWER SILURIAN FORMATIONS.

This division of the Silurian system, as at present recognized in the United States, consists of the following members: Potsdam and calciferous sandstones, or No. I. of the Pennsylvania survey; Chazy, Birdseye, Black River, and Trenton limestones, or No. II.; Hudson River group, including Utica slate, or No. III. of the same survey. In geographical range these three divisions are nearly co-extensive; the latter having a less westerly extension than the others.

Potsdam and Calciferous Sandstones.—These two rocks often alternate with each other at the line of junction, and in many places a friable arenaceous deposit succeeds the calciferous sandstone, being evidently a repetition of the preceding. These rocks are found mostly in connection, though the Potsdam sandstone is the most conspicuous member. Entering the United States on the north from the St. Lawrence valley, the formation stretches across the northern part of the State of New York to the outlet of Lake Ontario. It may be followed along the valley of Lake Champlain southward, and thence interruptedly through New Jersey, Pennsylvania, Maryland, Virginia, and Tennessee. Extending through Canada, it skirts the northern shores of Lake Huron, and is still more conspicuously seen upon the shores of Lake Superior. It extends from the outlet of this lake westward into the northern part of Wisconsin, where it occupies a broad area. Along the Mississippi River the high cliffs (so conspicuous a feature in the scenery between Prairie du Chien and the Falls of St. Anthony), are formed by the Potsdam sandstone, capped by the calciferous formation which has here become a true magnesian limestone. Owing to the more rapid disintegration of the

friable sandstone this limestone is left in outliers. It is here known as the lower magnesian limestone, and is described under that name by Dr. D. D. Owen, in his report of Iowa, Wisconsin, and Minnesota.

Chazy, Birdseye, Black River, and Trenton Limestones.—These four members of the series are very distinct in their eastern extension, and in the central part of the State of New York; but every where the Trenton limestone is the most conspicuous, and often gives name to the whole group. This limestone series enters the United States from the north by the St. Lawrence and Champlain valleys, both of which it occupies throughout their extent. It continues with slight interruptions through New York, New Jersey, Pennsylvania, and Virginia, to Alabama. In New York it extends westward along the valley of the Mohawk, Trenton Falls, and Black River, to the eastern end of Lake Ontario; thence crossing the St. Lawrence it passes through Canada to the shores of the Georgian Bay and the north side of Lake Huron. Forming in great part the Island of St. Joseph, it crosses the upper peninsula of Michigan, from the St. Mary's River westward, and forms the west shore of Green Bay from Little Bay de Noquet to the mouth of Fox River. Thence it extends southward and westward, forming a broad belt, embracing the southern part of Wisconsin and northern part of Illinois. It crosses the Mississippi River, stretching into Iowa, and occurs at intervals capping the lower rocks, as far as the Falls of St. Anthony. Beyond this point north or west little is known of this limestone series within the limits of the United States, though it exists farther to the north and northwest within the British territories.

These limestones are every where important. For economical purposes they are of most value in their eastern extension, where they are nearly pure limestones, containing only occasional interposed layers of chert and thin seams of slate. Towards the west the proportion of shaly matter increases, and in some places, as at the Falls of St. Anthony, this exists in such large proportion as to render the greater part of the rock unfit for any economical purpose.

In the western extension of this group of limestones we find an important member added to the series. The galena or lead-bearing limestone of Wisconsin, Illinois, and Iowa, which until recently has been included among the Upper Silurian rocks, is now proved to belong to the Lower Silurian, resting directly upon the Trenton limestone proper, and apparently forming an intermediate mass between that limestone and the Hudson River group. The most easterly extension of this bed of limestone is about the region of Little Bay de Noquet or the Escanaba River, but it becomes of importance only after entering the State of Wisconsin.

Hudson River Group.—This formation has a great development towards the northeast; and entering the United States from Canada, we find it continuing along the eastern shore of Lake Champlain, much of it in a partially metamorphic condition. South of Whitehall its width increases, and it is seen on both sides of the Hudson River, more generally in its normal condition. It follows the Hudson valley to Newburgh, thence southwest it extends through New Jersey, Pennsylvania, Maryland and Virginia, sometimes in a single belt, and sometimes in two which again unite. The general direction is the same as the Alleghany range, and it corresponds in outline to the preceding and superior formations. Between Kingston, on the Hudson, and the Mohawk River, these strata pass beneath the lower limestones of the Helderberg: and along the Mohawk valley they continue westward with numerous undulations, finally rising to the summits of the hills on either side of the river. In Oneida County, a little to the west of the town of Rome, the southern margin of the rocks of this group crosses the Mohawk and continues in a northwest direction, spreading out over large areas in Lewis, Oswego, and Jefferson counties.

The line of these rocks may again be taken up on the northern shore of Lake Ontario, and followed to the shores of Lake Huron. The group is thence traced along the northern shore of the Manitoulin islands and across the peninsula from St. Mary's River to the Bay de Noquet. Thence it trends southwesterly, and having been there deeply denuded, its place is occupied by the waters of Green Bay. It reappears near the southern extremity of Green Bay, and passes to the east of Winnebago Lake. Beyond this its extension in Wisconsin has not been satisfactorily traced, though it appears probable that the thin bedded shaly limestone, with shaly partings and some thicker beds of shale, on the Mississippi, are a continuation of this group. The arenaceous material has ceased before reaching the St. Mary's River, and the group consists mainly of finely comminuted shaly matter with calcareous bands, and sometimes thicker beds of the same material.

The shaly and marly beds, with calcareous bands of greater or less thickness, which are so well known in the neighborhood of Cincinnati by their abundant fossils, are of the same age and have precisely the same character as the rocks of this group on Little Bay de Noquet. The broad area of this group around Cincinnati extends with diminishing width in a southwesterly direction, but again expands in central Tennessee, forming a zone nearly as extensive as that around Cincinnati. This part of the group is even more calcareous than it is in the northern localities, and offers a strong contrast with the strata of the same age in New York and in Canada, where argillaceous shales, and shaly sandstones, and arenaceous beds, constitute the entire group.

Economical Products of the Lower Silurian Rocks.—Iron Ores are associated with the limestones of this series in Pennsylvania, and almost coextensive with them; though the ores are not necessarily connected with these deposits, and are confessedly of a posterior geological age. So far as we know, they can be sought successfully along the eastern margin of the Silurian limestones, in certain places dependent on geographical situation and elevation.* Iron ore occurs sometimes in the shales of the Hudson River group, but generally in quantities too small to be of much value. Iron pyrites is often found to be an abundant product of this group and the succeeding formation.

Lead Ores.—The most important product of the unaltered Lower Silurian rocks is galena (sulphuret of lead). As already described, the galena limestone of parts of Wisconsin, Illinois and Iowa, is of Lower Silurian age; and the production of lead in these rocks is restricted to this limestone.

The lead ores of Missouri likewise belong to rocks of the Lower Silurian period, though probably occurring in a different member of the series from those just enumerated.

In the Trenton limestone, in the State of New York, lead ores occur at numerous points; but none of the veins have proved remunerative on working.

A thin vein of lead ore was at one time wrought to some extent in the Calciferous sandstones of the Mohawk valley, and thin veins or strings of the same ore are not unfrequent in the same rock in other places.

Sulphuret of Zinc (zinc blende), in greater or less quantities, usually accompanies the lead ore in all the localities mentioned.

Carbonate of Zinc likewise occurs with the sulphuret, and with the lead ores of Wisconsin, Iowa, and Illinois; but thus far it has attracted little attention, either from being in insufficient quantity for working, or from other causes.

Copper Ores.—Sulphuret and carbonate of copper occur in the same limestone with the lead ore of Wisconsin; but the quantity has proved insufficient to justify mining operations. Copper ores likewise occur in the same formation with the lead ores in Missouri, and have proved more permanent than those of Wisconsin. Sulphuret and carbonate of copper sometimes occur in the calciferous sandstone, or lower magnesian limestone, but no permanent veins have been discovered.

The non-metallic materials of economical value which are found in the Lower Silurian rocks, may be enumerated as follows: Building and flagging stones from the Potsdam sandstone, in all its eastern localities. The stone from some beds of this rock are used for furnace hearths, and in many places it is converted into sand for glass making. In most of the western localities of Wisconsin, Iowa, and Minnesota, much of the rock is too friable for building purposes, but is admirably adapted to glass making; and the beds in many places are in a condition to allow of being shovelled up like ordinary alluvial sands.

Excellent building stones, and stone for heavy masonry are derived abundantly from the limestones of the Lower Silurian period. Some of the beds furnish a good black marble, which is used to some extent for ornamental purposes, and a much larger quantity which is used for floor tiling in alternate blocks with white marble, which is derived from the newer metamorphic rocks.

Roofing slates are derived from the slates of the Hudson River group in their partially metamorphic condition, and in some localities, even where the fossils are not entirely obliterated. Large quantities are obtained in the eastern part of New York, in Vermont and in Pennsylvania.

The thin bedded sandstones of the Hudson River group every where afford flagging stones of an excellent quality, which are best where the rocks are partially metamorphic; and the finest localities lie upon the border of the metamorphic belt.

UPPER SILURIAN ROCKS.

The upper division of the Silurian system in the United States may be regarded as commencing with the Shawangunk or Oneida conglomerate; and includes the Medina sandstone and Clinton group (those two constituting No. V. of the Pennsylvania survey); the great limestone formation of Niagara; the Onondaga salt group, and the Lower Helderberg limestones. The latter embrace the following divisions: Water limestone, Pentamerus limestone, Dethyris shaly limestone, Upper Pentamerus and Encrinal limestones, altogether constituting No. VI. of the Pennsylvania survey. The geographical ranges of these different groups, are extremely varied.

Shawangunk or Oneida Conglomerate.—This forms the lowest deposit in this series; and is composed of a great accumulation of massive sandstones both coarse and fine in texture, and strata of conglomerate, with thin beds of sandy shale. The conglomerate is made up of fragments, often but partially worn, and sometimes of large size; they are nevertheless so firmly cemented, that it appears as if silicious matter may have been in partial solution at the time of the aggregation of the materials. In comparison with the conglomerate of the coal measures, this conglomerate is more massive and compact, with materials less worn and rounded, and the finer arenaceous portions much more closely aggregated, forming a tougher rock, which in many places is broken only with difficulty. Many of the beds are greenish, and sometimes brownish or reddish, and some of these varieties are so compact and tough as to resemble porphyry and sienite. There is perhaps no rock in the series that so nearly assumes the character of a metamorphic or igneous rock, or that so soon becomes disguised under the influence of metamorphism.

This rock appears in the valley of the Mohawk, south of Utica, as a mass of less than twenty feet in thickness, gradually thinning out both in an east and west direction, while to the southward it passes under superior strata. Seventy miles farther south it again appears, forming the Shawangunk Mountain, which ranges from near the Hudson River, through Ulster, Sullivan, and Orange counties, to the Delaware River. Thence southwest, the same formation stretches through New Jersey and Pennsylvania, where it constitutes the Kittatiny Mountain, and through Maryland and Virginia; forming an almost continuous mountainous range from the Hudson River to the northern part of Virginia. Beyond the abrupt northern termination of the Shawangunk Mountain, near the Hudson River, below Kingston, the conglomerates and coarse

* These ores will be described more in detail under the head of economical products of the Tertiary formations.

sandstones of the formation are found mingled and intercalated with the underlying metamorphic slates of the Hudson River group in New York and Vermont. The heavy bedded white sandstones of this period, often destitute of vegetation over considerable areas, give a peculiar aspect to the mountains formed by this rock.

The range of the Shawangunk conglomerate marks very clearly the position of an ancient coast line at the close of the older Silurian epoch, indicating, by its accumulation and character, a period of disturbance greater than had taken place since the deposition of the Potsdam sandstone. This rock likewise marks the period of greatest change in the fauna of the Palæozoic rocks, or at least up to the period of the conglomerate of the coal measures, the accumulation of which preceded the appearance of dry land within the present limits of the northern continent.

Medina Sandstone and Clinton Group.—These formations, which may at this time be treated of as one, consist of a mass of soft, shaly, red sandstone, sometimes almost destitute of visible lines of deposition, overlaid by a series of shales, shaly sandstones, conglomerates, limestone beds, iron ore, &c. This series is well developed in the central part of New York, whence westward it becomes more calcareous, and diminishes in thickness, and at the Niagara River is reduced to a single thin bed of shale, and one of limestone. The course of this formation may be followed thence through Canada West. It is seen also in the islands of Lake Huron. see is distinctly characterized on the eastern shore of Green Bay, and has been traced as far westward as into Wisconsin. At the West, some of the limestone beds of this formation mingle with the overlying Niagara limestone. This group extends from the southern end of the Shawangunk Mountain, through New Jersey and Pennsylvania, where it is two thousand feet thick. It may be traced in some of its members through Virginia and Tennessee, and terminates with the Palæozoic rocks in Alabama.

Niagara Limestone.—This group, in its more perfect development, consists of a mass of soft, calcareous shale, resting upon the strata last described. This graduates above into a heavy bedded limestone, the intermediate part being thin bedded and shaly in character. In its eastern extension, this group is scarcely recognizable on the Hudson River, and becomes important only in the western part of the State of New York. From the Genessee River, westward, this group forms a distinct feature in the topography; a low terrace, called the "mountain ridge," commences at the Genessee River, and gradually increasing in height, extends westward by Lewiston, N. Y., Queenstown and St. David's, Canada West, and curves around the head of Lake Ontario. It forms the high terrace known, near the Niagara River, as Queenstown Heights. Trending more to the northwest, it forms the projecting headland, Cabot's Head, upon Lake Huron, and its line of strike is marked by the range of the Manitoulin islands, near the northern shore of Lake Huron. Passing to the north of Mackinac, it forms the northern boundary of Lake Michigan, and thence, bending southward, it constitutes the bold and extended peninsula between Green Bay and Lake Michigan, extending into Wisconsin. Through Wisconsin and Northern Illinois, it is traced as a continuous formation, and as outliers above the lead-bearing rocks, forming the high mounds or conical hills of this part of the country. The same formation skirts the broad area of Lower Silurian rocks in Ohio, Kentucky and Tennessee, and extends northward in a low axis to the western extremity of Lake Erie.

Along the eastern margin of the Palæozoic formations, it is of so little thickness, and so intimately united with the succeeding limestones, that it forms no important feature. In Canada, it has been recognized by Mr. Logan, and traced southward into Vermont, till it becomes merged in the great metamorphic masses of the Green Mountain range.

The Onondaga Salt Group, which has been so designated from being the source of the brines in the State of New York, is the succeeding member of the Upper Silurian system, and rests directly upon the Niagara limestone. It consists of red and gray shales and marls, thin beds of impure limestone, with thin shaly partings, and is terminated above by a mass of thinly stratified limestone, of an ashen color, which is, indeed, the prevailing color of the greater part of the group, with the exception of a few hundred feet at the bottom. This group has its greatest development in Central New York, and gradually thins out in an easterly direction, so as scarcely to be recognized upon the Hudson River. It can be traced through Canada West to the shores of Lake Huron, from the bed of which it has been excavated. It appears again, forming the base of the promontory at Mackinac, and at Point St. Ignace, which is the last place at which it is seen in this direction. The abundance of pebbles of drab-colored, porous, or vesicular limestone upon the islands and shores of Lakes Huron and Michigan, sufficiently testify of its former existence in that region. South and southwest from thence, it forms no conspicuous geological or topographical feature.

The Niagara and Onondaga Salt Groups, which are so important and conspicuous in Central and Western New York, thin out rapidly in an easterly direction; and as they pass beneath the Helderberg Mountains, and skirt the base of the hills along the Hudson River, as far as the Rondout Creek, they have a thickness of only a few feet. Farther to the south, these two formations are undistinguishable from the succeeding group; and the whole together are recognized as a single formation (No. VI.) in the Pennsylvania Survey.

Lower Helderberg Group.—Resting upon the formations last described, and forming a very conspicuous feature in the lower part of the Helderberg Mountains, and along the base of the hills bordering the Hudson River, the base of the Catskill Mountains, and thence southward, we have a series of the limestone beds, already enumerated. These limestones, both in their lithological characters, and in the nature of their fossils, are very distinct from the preceding formations. The lowest formation consists of a series of thin bedded limestones, which are extensively wrought for hydraulic cement, and hence have received the name of water limestone, or hydraulic limestone, and are also known as Tentaculite limestone, in the reports of the New York Geological Survey. To these thin layers, succeed heavy bedded limestones, containing an abundance of the fossil *Pentamerus galeatus*, and known as Pentamerus limestone. Next succeeds thin bedded limestone, with shaly partings, passing upwards into massive shaly limestone and calcareous shale, which, from the abundance of *Spirifer*, or Delthyris, has been called Delthyris shaly limestone. Then follow heavy beds of limestone, with a species of *Pentamerus*, and numerous remains of crinoidea, and known as Upper Pentamerus limestone.

These names are convenient for reference in portions of country where the group is fully developed. The entire group, however, may be known as the Lower Helderberg group of limestones, and is sufficiently distinct from the Upper Helderberg group, which will be described in the succeeding pages.

This group has its greatest development along that portion of country just described, and extending thence across New Jersey and Pennsylvania, is as well characterized in Virginia as in New York. In a southwesterly direction, it is coextensive with the Silurian rocks. West from the Hudson River, the group thins out essentially before reaching the central part of New York, and is nowhere recognized in a westerly direction. Still farther to the south and west, it appears together with the Niagara formation, in Tennessee.

In its geographical extent, and the direction of its development, this group is the reverse of the Niagara group. The latter, beginning in Eastern New York with an insignificant thickness, trends westerly and northwesterly through Canada, and passing round the northern margin of Lakes Huron and Michigan, it stretches away to the Mississippi River, which it reaches just north of the mouth of Rock River. The Lower Helderberg, on the contrary, has an increasing thickness from Central New York towards the Hudson River, where it has its full development, and follows a southwesterly course, as the line of its greatest development, reaching Tennessee and Alabama, still preserving its characteristic features and fossils, by which it is known upon the Hudson River.

In the present state of our knowledge, we regard the Silurian system as terminating, in the ascending direction, with this formation.

Economical Products of the Upper Silurian Rocks—Among the more prominent economical products, are the iron ores of the Clinton group, which occur in one or two distinct beds, alternating with limestone and shale. These beds are of great importance in New York, Pennsylvania, Virginia, and Alabama, and are not unimportant in Wisconsin.

The Onondaga Salt group affords an abundant supply of gypsum throughout the greater part of its extent in New York, and likewise to some extent in Canada.

The brines, which have their origin in the Onondaga Salt group, are of the highest economical value in the State of New York. At the present time, more than 5,000,000 bushels of salt are annually manufactured from these brines.

DEVONIAN SYSTEM.

At the present time, most geologists include in the Devonian System, all the formations, from the groups last described, or from the Lower Helderberg group, to the Catskill Mountain group inclusive. These are as follows: The Oriskany Sandstone (No. VII.); the Upper Helderberg limestones, composed of the Onondaga and corniferous limestones; and the Hamilton, Portage and Chemung groups of New York, or all those constituting No. VIII. of the Pennsylvania Survey; the Catskill Mountain group, or No. IX., which is terminated above by a formation of coarse sandstone and conglomerate, recognized as No. X. in the Pennsylvania Survey.

The different groups here noticed have a very unequal development, and very different geographical extent. The materials composing them are of different character, and as a consequence, also, the economical products, which vary with the different groups, and have a geographical extent corresponding thereto.

The lowest member (the Oriskany Sandstone) included in this series of formations, is, when best developed, a porous friable sandstone, with numerous cavities showing casts of the interior of shells, the testaceous coverings of which have been dissolved and removed by the percolation of water through the surrounding porous mass. This sandstone has its greatest development in Pennsylvania and Virginia, where it attains a thickness of seven hundred feet or more. In its northern extension, it diminishes rapidly in thickness; and in New York, it never exceeds thirty feet, and is often less than three feet in thickness. Its western limit is near the line of Cayuga Lake, in New York. It is not found on the west of the Alleghany Coal Basin.

The Upper Helderberg group, composed of what are known in the State of New York as Onondaga and Corniferous limestones, has a wide range and very marked character. Forming a prominent feature in the Helderberg Mountains, near the Hudson River, these limestones extend thence westerly, and are conspicuous throughout the length of the State. Crossing the Niagara River at Black Rock, we find the same formation extending through Canada, and in places skirting the shore of Lake Huron, on the Michigan side. The same group appears forming the high island of Mackinac, from whence its course is southwesterly; but the excavation of Lake Michigan in that direction has nearly obliterated the evidence of its existence. South of Chicago, however, we take up the same formation, tracing it across the State of Illinois. Thence beyond the Mississippi River, it extends through Iowa, forming the soil and scenery of the beautiful and fertile valley of Cedar River.

The same formation occurs on Lake Erie, in the vicinity of Sandusky and Manmee, and may be traced on both sides of the axis extending through Ohio, Indiana, Kentucky and Tennessee.

Southward from the Helderberg Mountains, it is traced through New Jersey and

into Pennsylvania; but although recognized, it is less conspicuous and important than over those portions of country already described.

The Hamilton, Portage and Chemung groups, which succeed this limestone formation, have a nearly equal geographical extent; and though varying in some parts very widely in their lithological characters, they may be described in connection. In New York, the base of the formation is a black, slaty shale, succeeded by other shales and shaly sandstones, and thicker bedded sandstones, known as the "Olive shale formation," from their prevailing color; and also as the "Waverley sandstones," and the "fine grained sandstones" of the West.

This formation has its greatest development on the eastern side of the Alleghany Coal Basin, where it attains a thickness of several thousand feet. Some of its beds consist of hard, argillaceous sandstone; and in its eastern margin, the arenaceous ingredient prevails over the argillaceous. Extending westward, it occupies a broad belt of nearly the width of two ranges of counties in Southern New York, and thence bends around parallel to the shore of Lake Erie, and occupies the whole breadth between the lake and the coal formation to the southward. It continues in a broad belt, known as the Black Shale and Waverley Sandstone, through Ohio, from north to south, and thence extends into Kentucky, and, with some modification, reaches the State of Tennessee. It flanks the eastern side of the Illinois coal field; again, on the Mississippi River, it is seen passing beneath the carboniferous limestone of Iowa and Missouri. The writer has recognized several fossil species from localities on the Mississippi River, which are common to the same formation in New York.

The Catskill Mountain Group, or No. IX. of the Pennsylvania Survey, consists mainly of a series of red shales and sandstones, with sometimes coarser beds which assume a conglomeratic or brecciated character; and which would appear to represent the cornstones of the English Old Red Sandstone. Some of the beds are greenish, and others of a gray color, and the whole mass is comparatively destitute of fossils with the exception of remains of fishes. This formation has an exceedingly local development and is scarcely recognizable west of the Alleghany coal field. It is most important in the northeastern part of Pennsylvania, and in the region of the Catskill Mountains, in New York, where it attains a thickness of three thousand feet, and constitutes nearly the entire elevation of these mountains to the summit, which are capped with the conglomerate already mentioned as resting above the Catskill Mountain group. In its western extension this group thins out; and in the northwestern part of Pennsylvania and the southwestern section of New York, it is nearly lost. A few feet in thickness can sometimes be observed; and elsewhere, where no section of the beds is presented, the evidence of its former existence is preserved in the red color of the soil. In its southern extension this group is less persistent than the preceding, but follows the same direction.

The succeeding beds of Conglomerate, which form a marked feature in the topography of the country along the eastern side of the great Alleghany coal field, may be regarded as the dividing line between the groups below and the groups above, or between those which have usually been regarded as Devonian, and those of the Carboniferous age.

The agencies in operation through the entire period of the formation of the Catskill Mountain group, do not appear to have ceased during the production and deposition of the succeeding conglomerates and sandstones; which also have shaly bands in their composition. This latter formation seems due to the accession of new disturbing forces, or to an increase of previously existing ones, producing the conglomerates which mark this period.

Economical Products of the different Rocks and Groups included in the Devonian System.—The limestone formation of the Upper Helderberg, throughout its extensive range, produces some of the best building stones in the country. The quarries in the Onondaga limestone of New York have afforded excellent material for the locks and other structures upon the enlarged Erie Canal in New York. It is also very valuable for the production of lime.

The Hamilton, Portage, and Chemung groups of New York, the Olive slate and sandstone formation, or part of No. VIII. of the Pennsylvanian Survey, produce little of economical value beyond building and flagging stones. These latter from the upper part of the Hamilton group along the Hudson River, are very superior, and for large size, smoothness, and the even thickness of the slabs, are unsurpassed in the United States. Many are obtained from six to eight and ten feet square, and not varying in thickness more than a quarter of an inch. The beds are from one to four inches in thickness. In the central part of New York the good flagstones are restricted to the Portage group; in which formation there are also some good building materials. In Ohio and Indiana the Waverley sandstones and fine-grained sandstones often furnish good materials for buildings.

In the lower part of this formation in Pennsylvania, and not far removed from the calcareous beds below, there is a thick and extensive band of *iron ore*. The geological reports of Pennsylvania represent this ore to be from three or four to ten or fifteen feet in thickness. Such a bed of ore, widely distributed as it is along the outcrop of the formation, is of immense value.

In the upper part of the Catskill Mountain group, there is a bed of iron ore connected with the shales and sandstones: and which in some parts of Pennsylvania is of economical importance.

This formation of Conglomerate overlying the last, or No. X. of the Pennsylvania Survey, produces, in some of its beds, flagstones; and some of the harder sandstones afford good building materials; as well as heavy stones for other architectural purposes. Some of the conglomeratic beds are well adapted to furnish heavy and rough stones for the locks of canals, for which they have been used in Pennsylvania.

In Virginia, Prof. W. B. Rogers has discovered in this formation some thin seams of coal; but nothing which justifies the expectation that valuable deposits of this mineral will ever be obtained from the rocks of this age.

The *Red Shale* of the Carboniferous period, or No. XI. of the Pennsylvania Survey, though separated by the great thickness of sandstones and conglomerates from the Catskill Mountain group, bears in some respects a close resemblance to it; consisting of red shales, shaly sandstones, and bands of limestone. In Pennsylvania this formation is very prominent, though scarcely extending northward beyond the limits of that State. It surrounds in continuous, narrow valleys, the anthracite basins of the State, bounded on one side by the ridges of the formation just described, and on the other by the conglomerate of the coal measures. Towards the northward it more or less thins out and allows the conglomerate of the coal measures to rest upon the arenaceous and conglomeratic beds of the preceding formation.

In tracing this formation southward into Virginia, its calcareous character becomes more fully developed, and it is marked by distinct bands of limestone which are of immense importance to the region occupied by these rocks. In the southern part of Virginia the group would be most appropriately described as one of limestone, shale and sandstone. Such is the character of the formation, which finally graduates into a limestone group, elsewhere designated as the carboniferous limestone.

CARBONIFEROUS LIMESTONE.

The limestone formation which is so largely developed beneath the coal measures of the West, is without question equivalent in part to the great carboniferous limestone of Europe. The coal measures in the United States, however, do not every where repose upon a limestone formation. Along the eastern and western margin of the Alleghany coal field the conglomerate, which is here the fundamental rock of the coal measures, generally rests upon the red shale formation already described.

In a southerly direction the latter formation becomes highly calcareous, and finally either passes into a limestone, or its place below the coal measures is occupied by a heavy limestone formation. This limestone does not become conspicuous till we reach the southern part of Virginia; but from thence southward it becomes a prominent and important member in the series; underlying the coal measures of Tennessee and Alabama. On the western side of this coal field, it is equally conspicuous, extending as far north as Kentucky, but has entirely thinned out, or become merged in the underlying shales and sandstones, before reaching the Ohio River. To the north of this point, the entire western margin of the Alleghany coal field, rests upon what are known as the Waverley Sandstones of Ohio—the Chemung group of New York.

This limestone has its greatest development in the broad zone which encircles the great Mississippi coal field; and which rising in a low axis is excavated by the channel of the Mississippi River, from below the mouth of Rock River nearly to the mouth of the Ohio. Farther to the west it has been recognized in the vicinity of Fort Laramie, and in the high plateaux around the great Salt Lake. In the region southwardly it extends to the southern limit of the United States. Throughout the Rocky Mountain range, and in the country for some distance east and west, this limestone is interrupted by large areas of eruptive and metamorphic rocks, and is itself often metamorphosed to such a degree as to have become partially crystalline.

Economical products of the Red Shale, and the Carboniferous Limestone.—In the Red Shale, or No. XI. of the Pennsylvania Survey, occur extensive beds of iron ore, which from their proximity to the coal measures are of great importance to the iron trade of Pennsylvania. This ore is chiefly found near the junction of the Red Shale with the sandstone below, though often also in small quantities near the upper part of the formation, or near its contact with the conglomerate of the coal measures.

The same ore occurs in Maryland and Virginia, and is of equal economical value.

The calcareous bands of this formation in Pennsylvania are important to the agricultural interests of that portion of the State, as furnishing lime, fit for agricultural purposes, in a tract of country destitute of other calcareous formations. Farther to the south, in Virginia, this red shale formation is so calcareous as to give rise to a soil of great fertility.

The economical products of the carboniferous limestone, are, mainly, building stones, lime, and hydraulic cement. Some of the crinoidal crystalline layers serve the place of coarse marbles; and some of the more compact varieties exhibit buff and variegated colors, and are capable of receiving a tolerable polish. These marbles are used to some extent in the West for ornamental purposes.

The great economical value of this formation is in giving fertility to a wide belt of country; and rendering extremely productive not only the tract immediately without the limits of the coal field, but more or less the area within. In this respect the coal measures of the West, and the surrounding country, present a striking contrast with similar geological and geographical positions in the Alleghany coal field.

COAL MEASURES, OR COAL FORMATION.

Succeeding the Carboniferous limestone, where that rock occurs, or, in its absence, resting on the formations previously described, we find a series of sandstones, shales and beds of coal, alternating with each other and sometimes with beds of limestone; and the whole usually underlaid by a heavy-bedded conglomerate.

This series of beds, so named from the coal, its most prominent and important member, has a very great extension in the United States, and in the adjoining British provinces. The immense thickness of this formation in some localities, and the numerous alternations of its different beds, are truly astonishing.

The great coal formation in the United States is one of its principal and most striking geological features; and in its influence upon our industrial pursuits, it is un-

questionably the most important of all. The coal measures are distributed over two principal areas, which may be termed the great eastern and western coal fields; being separated from each other by a wide area of older formations. The eastern or Alleghany coal field may be traced from near the northern limit of Pennsylvania to the southwest, in a line parallel with the Alleghany chain, quite to the central part of the State of Alabama. The anthracite basins, which are of comparatively small extent, lie beyond or to the east of the line here traced as the limits of the great eastern coal field.

From its northeasterly margin it is traced along a very irregular outline as far as the Alleghany River in Warren County; and from thence it follows a general direction parallel to the shore of Lake Erie, to Portage and Summit counties, in the State of Ohio. From thence it follows a line generally parallel to its eastern margin, though gradually converging to its southern extremity in Alabama. This coal field has a length of more than seven hundred and fifty miles, and an extreme breadth of one hundred and eighty miles. The superficial area has been estimated, by Richard C. Taylor, to be sixty-five thousand square miles; and when we consider the aggregate thickness of the different beds of coal over this wide extent, the aggregate amount of fossil fuel appears indeed incomprehensible.

The great western coal field, or, as it has been usually termed, the Illinois coal field, occupies the larger part of the State of Illinois, and parts of Indiana and Kentucky. It is separated only by a narrow belt of the lower formations, along the Mississippi valley, from the coal fields of Iowa and Missouri, the extent of which has lately been shown to be much greater than had been supposed.*

Including the parts of this field on both sides of the Mississippi River, its greatest extent from southeast to northwest, or from the headwaters of Green River, in Kentucky, to its northern limit on the Des Moines River, in Iowa, is more than five hundred miles; while its greatest breadth across the States of Indiana, Illinois, and Missouri is more than four hundred miles; and from its northern termination in Iowa to its present known limits on the Osage River at the south, is more than three hundred miles. This western coal field, therefore, including the area thus occupied on both sides of the Mississippi River, has a much greater superficial extent than the eastern coal field already described. We may perhaps estimate the entire area at once and a half that of the Alleghany coal field, or nearly one hundred thousand square miles.

Still farther to the south, in Arkansas, there is a coal field of considerable extent, which has not yet been fully explored. This may probably be connected with the one in Missouri.

Besides these, there is a smaller coal field in Michigan, which is entirely separated from either of the others. This has so far proved unproductive, and from its position in a flat country, but little elevated above lake-level, it is not likely soon to be extensively explored. Otherwise its geographical position, and proximity to navigable waters, would render it more favorable for exploration, than either of the other coal basins.

In Rhode Island and Massachusetts we have a considerable area of the coal measures, though affected more or less by the metamorphic action, which has obliterated the coal from a great part of its original area and rendered it extremely hard and anthracitic.

Added to these inexhaustible supplies of mineral fuel in the eastern United States, coal has been brought by Capt. Stansbury from near Fort Laramie; and more recently by Capt. Ottinger from Bellingham Bay and Puget's Sound. The true geological position of these coals has not been determined, though they have the appearance of ordinary bituminous coal.

The entire area occupied by coal measures in the United States, east of the Rocky Mountains, is nearly or quite two hundred thousand square miles.†

Economical Products of the Coal Formation.—Coal is an element of national wealth compared with which all other economical products are of secondary importance. Mineral fuel lies at the base of all our manufacturing and mining operations; and we can no longer make progress in the arts of civilization without the increased and extended application of this material. Manufacturing enterprises, which, in the infancy of our country, were carried on mainly through the agency of water power, are rapidly extending to parts of the country where this motive power does not exist; and the proximity, or cheapness of mineral fuel, is regarded as an element of far greater importance in the calculations of manufacturing enterprise.

No other department of our national resources has experienced so rapid a development as coal-mining. Until recently, anthracite coal alone had been the principal fossil fuel supplied to the towns and cities east of the Alleghany Mountains. The increase of this trade is beyond a parallel in any country. In 1820 there were but 365 tons of anthracite consumed in the United States; in 1830 this amount had reached nearly 143,000 tons; while in 1853 more than 5,000,000 tons have been mined and sent to market. Numerous coal mining enterprises have sprung up during this period, outside of the anthracite region, and large quantities of semi-bituminous coal are furnished from the Cumberland mines in Maryland, and from the Richmond and Chesterfield basin, Va.—the latter probably of the age of the Lias.

While these immense quantities of coal have been consumed in the country east of the Alleghany Mountains, the consumption of bituminous coal in the Ohio valley, and its shipment to southern ports has nearly kept pace with the development of the eastern coal field. In 1851 it was estimated that the bituminous coal consumed in Pittsburgh and shipped to ports below, including that from the Monongahela, amounted to more than 1,000,000 tons. To this is to be added all the coal mined and shipped upon the Ohio River and its tributaries above Cincinnati, which is still within the eastern basin; and beyond this we are to take into account all that is mined from the western or Illinois basin, which is becoming of great importance on both sides of the Ohio River.

It is probable that the amount of bituminous coal consumed in the United States at the present time is nearly equal to the anthracite; and we may estimate the consumption of both together at more than 8,000,000 tons, with a certainty that this amount will be more than doubled in the next ten years.

Iron Ores.—The coal formation of the United States everywhere contains an abundance of iron ore. The ores are chiefly carbonate and hydrous per-oxide of iron, the latter resulting chiefly from the decomposition of the carbonate, which is argillaceous, calcareous or silicious in its composition, decomposing readily on access of atmospheric air and moisture.

These ores are wrought in Pennsylvania and Ohio to a far greater extent than elsewhere in the United States. In Tennessee, Alabama, Western Virginia, Illinois, Kentucky, and Missouri, iron ores also abound in the coal measures. In Tennessee iron is manufactured to a considerable extent; and in Missouri this branch of industry is rapidly increasing. Notwithstanding the great area of coal measures in Illinois, there exist at the present time but two furnaces for the manufacture of iron in that State.

Although great progress has been made in the manufacture of iron during past years, it is insignificant when compared with the future of this branch of our national industry. Besides the iron ores accompanying the coal measures in their wide extent, this formation in many localities reaches to the proximity of iron ores in other geological formations, so that the supply of ore will always keep pace with the demand and with the supply of fuel. It is almost needless to add that every where throughout the coal measures of the United States, beds of fire clay and of fat clays fit for the production of fire bricks, common bricks, gas retorts, and furnaces of every description abound. Many of the sandstones accompanying the coal also possess every requisite for furnace hearths, and others are sufficiently pure for the manufacture of glass, clearly indicating in no distant future, the existence of numerous and productive branches of manufacture.

RED SANDSTONE FORMATION OF THE CONNECTICUT RIVER VALLEY, NEW JERSEY, ETC.

This formation, which has been regarded by geologists as of the age of the New Red Sandstone or Trias of Europe, consists of a series of shales, shaly sandstones and conglomerates; often alternating with each other in thin beds, but each one having in certain parts of the formation a great local development. The shales and shaly sandstones are usually highly micaceous, as are the sandstones; but some of the softer shales, or marly deposits, do not exhibit this characteristic. The general color of the formation is red, or redish brown; but some of the shales are of a dark slate color, or nearly black, and highly bituminous and fetid.

This sandstone formation occupies a broad belt along the Connecticut valley, (with one outlying basin in the western section of Connecticut,) extending more than one hundred miles from north to south, with an average width of twelve to twenty miles. The same formation occurs along the valley of the Hudson River below West Point; and extends thence through the State of New Jersey, where it has its greatest expansion. Contracting as it enters Pennsylvania, it gradually diminishes in width, until, in Maryland and Virginia, it has become a narrow belt, which is interrupted in Albemarle County, Virginia, and reappears only in outlying basins farther south.

The peculiar scenic feature of this formation is due to the intrusion of dykes and crescent-shaped masses of trap (diorite) which form hills sometimes 1500 feet above the sea, with bold mural faces and columnal fronts to the south-southwest, and gradually declining in the opposite direction to the level of the surrounding country: e. g. East and West Rocks at New Haven, the Hanging Hills in Meriden, and Mount Tom and Mount Holyoke in Massachusetts.

Economical Products of the Red Sandstone Formation.—The most prominent economical product of this formation is the "freestone" so extensively used for architectural and ordinary building purposes. The quarries of this rock on the Connecticut River at Portland, furnish it to all the maritime cities of the United States. More building materials are derived from this than from any other geological formation in the United States. The same rock is likewise extensively quarried in New Jersey, and at some points on the Hudson River in New York.

The only ores of importance in this formation, are *ores of copper*. They occur at several places in Connecticut, but have never been wrought with much success. The best known of these deposits is in the town of Granby (Simsbury); at this mine the ore is vitreous copper, with small quantities of variegated copper and malachite. Those deposits of copper which appear upon the margin of the Connecticut sandstone and run into the adjacent metamorphic rocks offer promise of permanent value, as at Bristol, Conn., where a large amount of copper has been taken out. The ore there is glance copper, copper pyrites, and purple copper.

In New Jersey copper ores occur in numerous localities, but the many mining enterprises have all proved unsuccessful. In that State the prevailing ores are green carbonate and silicate of copper. In some mines the vitreous and variegated copper ore with red oxide, and more rarely, phosphate and silicate of copper, and native copper are found. These ores in New Jersey appear not to occur in regular veins; but are disseminated through certain slaty layers, and sometimes aggregated in such quantities as to give promise of success to mining enterprises.

In Pennsylvania, particularly in the counties of Montgomery and Chester, produc

* Report of Dr. D. D. Owen, on Wisconsin, Iowa, and Minnesota.

† The coal fields of Richmond and of North Carolina are not included in this estimate, these being probably (as is hereafter mentioned) of a more recent geological age.

tive veins of lead and copper ores occur at the junction of the Gneissic and Red Sandstone formations, and some of these penetrate the latter rock and continue productive. In the sandstone of this region the copper ores prevail over the lead ores, while the reverse is often true of the same veins in the gneiss rocks. The principal ores are sulphuret and phosphate of lead, and sulphuret and carbonate of copper, with smaller proportions of other ores of lead, copper, zinc and silver, with iron and manganese.* The most unique feature in the mineralogical cabinet of the New York Exhibition was the collection of the ores from these veins, exhibited by Mr. Wheatley; for a more extended notice of which, reference may be had to the Illustrated Record, p. 57.

Barytes (heavy spar) has been wrought to some extent in this formation. Two veins are known in Cheshire, Conn., which are now worked, and from which large quantities of this mineral have been taken to grind for mixing with white lead as a pigment. Another vein has been worked at Northampton, Mass., where it carries small quantities of galena and zinc blende, as do those of Cheshire, copper as green malachite and variegated copper ore.

OOLITIC OR LIASSIC FORMATION.

[*Including the Coal Basins of Richmond, Va., and of Deep River, N. C.*]

To the east of the belt of the red sandstone formation just described, and forming what is known as the Richmond or Chesterfield Coal Basin, in Virginia, we find a series of shales, sandstones, and conglomerates, with beds of coal. The vegetable remains of the coal shales, together with other fossils of the series, have been regarded as sufficient evidence that the contents of this basin are of the age of the Lias and Oolites of Europe. The same association of beds, coal and organic remains, exists in the Deep River basin in North Carolina, lying in the same line, in a southwesterly direction from the Richmond basin. This is likewise referred to the age of the Lias or Oolite.

The evidence which is relied on for the separation of these two belts, lying parallel to each other, appears to us to be mainly of a negative character. The presence of the coal shale and plants in the one, and their absence in the other, does not afford the means of comparison. The occurrence of fishes in the Richmond basin, as well as in the sandstone of the Connecticut and New Jersey, affords means of comparison; and the similarity of forms seems hardly to warrant their separation into groups belonging to distinct geological periods. In a sketch like the present, however, it is unnecessary to discuss the arguments which might be adduced in relation to the age of these formations; and we therefore describe them under those names by which they are generally acknowledged by geologists.

Economical Products of the Oolitic Period.—The most prominent economical product of the formation referred to this period, in Virginia and North Carolina, is the coal of Richmond, Chesterfield, and Deep River. In the two former localities, large quantities of this coal are mined and sent to market. Although we have no reliable statistics for the few past years, we may presume, from former statements, that the amount exceeds 100,000 tons annually.

The other products of this formation, are almost identical with those derived from the red sandstone formation, viz. building and flag stones.

THE CRETACEOUS FORMATION.

This formation occupies a broad belt in New Jersey; extending thence through Delaware, and southward, it appears at intervals in Virginia, and North and South Carolina, where the overlying tertiary beds have been removed. Thence it crosses the northern part of Georgia, and central part of Alabama; and extending into Mississippi, it passes northwardly along the valley of the Mississippi, by the western margin of the Palaeozoic rocks, as far as to within the State of Illinois. West of the Mississippi River, it follows the line of the Palaeozoic formations through Arkansas, becoming of great width in Texas. To the northward, it extends with variable breadth along the eastern slopes of the Rocky Mountains, to beyond Fort Mandan on the Missouri River. From north to south, its extent is more than twenty-four degrees.

Notwithstanding the great area occupied by the cretaceous formation in the United States, no true chalk has been discovered.

Economical Products of the Cretaceous Deposits.—These, when compared with those of the preceding systems, are generally unimportant. Iron ores have been found in small quantities. Lignite occurs on the Upper Missouri and on the Yellowstone River in extensive beds, which at some future time may be of economical value. The materials of this formation, green sand, or marl, are much used by agriculturists in New Jersey, and the Southern States. This substance is sometimes nearly or quite destitute of fossil shells; in other localities it contains them in great numbers. The fertilizing effects are due to the contained potash, and also, perhaps, to sulphate of lime, derived from the double decomposition of sulphate of iron from iron pyrites, and carbonate of lime from fossil shells.

TERTIARY FORMATIONS OF THE UNITED STATES.

The tertiary formations of the United States are of marine, estuary and fresh water origin, consisting of numerous argillaceous, arenaceous and calcareous beds, and of others where these materials are more or less intermingled. These deposits contain shells, corals, and other marine organic remains, fresh water shells, land plants, and numerous mammiferous quadrupeds, some of which are of large size.

These formations have a wide range in the United States. If we include the estuary deposits of the valleys of Lake Champlain and the St. Lawrence, and some others on the coast of Maine, they commence at the northeastern extremity of the United States, and extending southward, become well defined in New Jersey, and occupy a broad belt between the base of the Appalachian mountain range and the Atlantic Ocean. The tertiary deposits spread around the southern termination of the high lands occupying the southern parts of Georgia, Alabama, and Mississippi, with a large part of Louisiana and Texas, bordering on the Gulf of Mexico. Along the eastern base of the Rocky Mountains, these formations form a broad belt, flanked on both sides by the cretaceous. The deposits of tertiary age are found around the sources of the Missouri, and form, together with the cretaceous, the vast deserts known as the Mauvaises Terres.

Between the Rocky Mountains and the Sierra Nevada, these formations are very extensive, as has been shown by fossils brought from those regions by Capts. Fremont and Stansbury, from many widely separated localities. They are also known to exist in extensive areas on the Pacific coast.

The cretaceous and tertiary formations between the Mississippi River and the Rocky Mountains, occupy a much greater extent than the whole area of Silurian, Devonian, and Carboniferous strata between the Alleghany Mountains and the Mississippi River; and probably greater than the space occupied by all the rocks together east of the Mississippi River.

The Economical Products of the Tertiary Formations.—Brown hematite and ochreous iron ore; black oxide of manganese; brown coal, sometimes found associated with the hematites, fire clay, porcelain earth, kaolin, etc., potter's clay, shelly marl and green earth. The materials for building are neither abundant nor durable, the coarser friable sandstone being the only substance of this kind. This want, however, is in a great measure supplied by the abundance of clays and brick earth, which become, in these formations, a substitute for building stones. This deposit is one of the most important sources of iron ore, furnishing an excellent material, and readily wrought.

QUATERNARY FORMATIONS, OR DRIFT AND ALLUVIAL.

The deposits of the Drift period are distributed over the larger part of the United States. In mountainous regions, these superficial accumulations, lying next to the older rocks, are usually unstratified, and fragments of all sizes, from pebbles to bowlders, more or less worn, lie confusedly mingled together. Over a large part of the great plain west of the Alleghany range, this deposit is more or less stratified, and the materials sorted. Water-worn rocks and fragments are every where found, and universally the older formations bear evidence of powerful erosive action.

In general, the character of this drift corresponds with the strata immediately underlying, or a short distance north of the locality; and although large bowlders of northern rocks are found one or two hundred miles south of their origin, no considerable proportion of the superficial materials have been derived from such distant points. It is only along a few valleys or watercourses that large quantities of these fragments have been carried; and the areas occupied by them are therefore small, compared with those covered with materials derived from rocks in close proximity. That the underlying geological formations can therefore mainly be relied on for producing their legitimate results upon the superincumbent soil, may with few exceptions be regarded as universal.

The most important economical product of these superficial formations is Gold, which existing in the newer metamorphic rocks, is found in the sands and gravels which are derived from those rocks, and form the drift and alluvial materials along the eastern flanks of the Appalachian chain. This gold-bearing drift extends from Maine to Georgia, though productive only in Georgia, the Carolinas and Virginia. It has more recently been wrought in Canada, but is probably not highly remunerative.

In California the gold-bearing drift is derived from rocks of similar character, and probably of the same age with those of the metamorphic rocks of the Appalachian chain.

Iron ore, in the form of magnetic iron sand, is an almost universal accompaniment of the drift; more especially in the vicinity of mountain ranges. Bog iron ore is a modern alluvial product. Hematite appears sometimes to be associated with the clays of this formation, though these more usually accompany the Tertiary deposits.

Sands and clays for brick-making and coarse pottery are very abundant. Peat, shell marl, and infusorial earth, are products of this formation, which can be applied to agricultural and other purposes; the former of these is to a limited extent employed as fuel. The drift pebbles are sometimes used with cement for building.

TRAPPEAN FORMATIONS.

The rocks of the Trappean formations are widely distributed in the United States; though their principal areas are those of the New Red Sandstone already described, of the Lake Superior region, and of the Rocky Mountain chain.

The most important formation of this kind in the United States is that of Lake Superior, where the copper-bearing Traps of the south shore are associated with rocks of the lower Silurian period. This formation is most conspicuously developed upon Keweenaw Point, and extends west and southwest in a broad belt, conforming generally with the shore of the Lake. On the south, this belt of Trap is flanked by sandstone of the age of the Potsdam sandstone, and on the north by conglomerates; and through the latter runs a narrow belt of Trap, parallel to the main or central formation. Towards the western extremity of Lake Superior, this Trap range becomes interrupted, and occurs only in insulated dykes or ridges, piercing through the sandstone formation.

Isle Royale, near the northern shore of the Lake, is mainly composed of Trap rocks, and presents many features in common with Keweenaw Point.

* See a very interesting report upon this region by Prof. H. D. Rogers, and the article on Pennsylvania minerals in the Record, p. 57.

That portion of the north shore of Lake Superior within the territory of the United States, is marked by numerous narrow belts and dykes of Trap, which continue entirely to the western extremity of the Lake. In the country between the western end of Lake Superior and the Mississippi River, the Trap appears in numerous ridges and dykes rising through the sandstone. On the St. Croix River at the falls, and on the Mississippi River above the Falls of St. Anthony, belts of Trap are of frequent occurrence. Throughout the whole extent here described, the associations of this Trap formation are so similar as to leave no doubt that it is all of the same age.

The Trap formation of Lake Superior, where occurring in its greatest development, is the repository of immense quantities of native copper. The Trap of Keweenaw Point is thus characterized, in a geological map of that region, recently published by J. D. Whitney, United States Geologist.

Amygdaloidal Trap, bearing native copper.
Crystalline Trap, in which the veins are not productive.
Porphyritic Trap, bearing sulphuret of copper.

The principal part of the formation of Keweenaw Point is composed of the former kind; a narrow strip extending longitudinally through the centre represents the crystalline portions, and a broader belt on the south side, adjoining the sandstone, is of the latter variety.

The Trappean rocks associated with the red sandstones of the Connecticut valley, and elsewhere with rocks of the same age, occur in such force as to produce, as already remarked when speaking of the Trias, marked features in the topography of the country; as Mount Holyoke and Mount Tom in Massachusetts; and the East and West Rocks near New Haven in Connecticut. The Trap likewise occurs in numerous, often parallel ridges, of a crescent form (as first indicated by Dr. Percival in his geological map of Connecticut), and in long continuous belts, throughout the extent of the Connecticut River valley.

The Palisades of the Hudson River, and numerous prominent ridges of Trap in New Jersey, are all of the same age and have the same associations. Finally, this Trap formation may be traced throughout Pennsylvania, Maryland, Virginia and North Carolina, every where accompanying rocks of this sandstone formation.

Native copper is one of the constant accompaniments of this Trap, but it has never been found in available quantities. Some ores of copper occur in the sandstones adjacent to the Trap rocks, and there appears to have been some connection between the intrusion of these Trap dykes and the segregation of the copper ores.

From the southern limits of the United States on the borders of Texas and New Mexico, northward to the country of the Blackfeet Indians, and even still farther to the north, Trappean and volcanic rocks are of frequent occurrence. Westward from this range in the great plain between the Rocky Mountains and the Sierra Nevada, rocks of this character occur at numerous points. Along the Columbia River and upon the Pacific coast, there are numerous and extensive formations of basaltic and volcanic rocks.

All these western and south-western formations of igneous and volcanic rocks are of more recent age than those already described. None of these appear to be older than the chalk period, and many of them are of Tertiary or more modern date.

In this review of the Trappean and volcanic rocks we have not included the dykes of Trap, greenstone and porphyry, which traverse the metamorphic rocks of the periods already described. In these positions they rarely produce any distinct features in the topography of the country; nor do they appear to have had any connection with the uplifting of the mountain ranges which they traverse. These dykes are found every where in the older rocks of the United States. In the eastern part of New England, and particularly near the coast, the strata are traversed by these dykes; and more extended belts of the same rocks occupy portions of the metamorphic regions. The porphyry belts appear sometimes to have resulted from extreme metamorphism, or igneous fluidity of previously existing formations.

Economical products of the Trappean and Volcanic Rocks.—The most important product has already been mentioned as the native copper and ores of copper on Lake Superior. The Traps of the age of the red sandstone of the Connecticut valley have yielded no metallic products of importance. In the southern part of the Rocky Mountain range, these igneous masses appear to have some connection with the intrusion of the metallic veins of sulphurets of lead and silver.

The rocks of these formations afford ordinary building stones of a very enduring sort; but from irregular fracture, and difficulty of dressing, they are little used except for rough walls and heavy work where ornament is not required. When, however, natural faces can be obtained, they make beautiful walls of several soft tints of color, as is seen in Trinity Church in New Haven.

[J. H.]

Having, under the last head, given a brief sketch of the principal geological formations in the United States in view of their chief economical products, we will now pass in review these products as represented in the collections of the New York Exhibition. The geographical order in which the minerals were arranged, had of course no reference to their geological relations, or to their classification as substances, with some partial exceptions. In the following annotations the subjects have been arranged in reference to their economical value. The order adopted is as follows:—

A. MINERALS OF ECONOMICAL VALUE.

1. Carbonaceous minerals and products.
   - Anthracites.
   - Bituminous coals (of the true coal and of the lias), Cannel coals.
   - Lignites and Brown coal.
   - Cokes and artificial fuels.
   - Graphite.
2. Ferriferous minerals and products.
   - Magnetic ores.
   - Specular "
   - Limonites "
   - Spathic iron and clay iron ores (Argillaceous).
   - Chromic iron.
3. Ores of other common metals.
   - Manganese.
   - Zinc.
   - Copper, cobalt and nickel.
   - Bismuth and antimony.
   - Lead and mixtures of lead with copper and zinc.
   - Tin.
   - Argentiferous galena.
   - Arsenic.
   - Cinnabar.
4. Precious metals and their ores.
   - Gold and auriferous quartz.
   - Silver and its ores.
   - Platinum and iridosmine.
5. Building and other architectural or ornamental stones.
   - Marbles. *a.* Statuary, *b.* Architectural. *c.* Ornamental.
   - Serpentines and verd antique.
   - Granite, gneiss, &c.
   - Freestone.
   - Trap.
   - Roofing slates.
   - Flags and tiles.
   - Miscellaneous (cements, &c).
6. Minerals, otherwise useful.
   - Salt.
   - Gypsum.
   - Limestone.
   - Phosphorite.
   - Marl and greensand.
   - Millstones, whetstones, grindstones.
   - Potters' and fire clay.
   - Feldspars and Kaolins.
   - Glass materials.
   - Firestones. Mica.
   - Tripoli and infusorial earth.
   - Substances used as paints (ochres, mineral paints, barytes, &c).

B. MINERALS OF MINERALOGICAL AND CHEMICAL INTEREST.

MINERALS OF ECONOMICAL VALUE, (INCLUDING MINERAL AGGREGATES OR ROCKS.)

1. *Carbonaceous Minerals and Products.*

GENERAL OBSERVATIONS.

The geographical distribution of coal in the United States, has already been sufficiently described. The great Alleghany coal field, extending from Northern Pennsylvania and Ohio to Alabama; and the Western coal field, extending from Northern Illinois and Iowa, to Southern Missouri and Kentucky; together with a smaller field in Arkansas, one in Michigan, and the anthracite of Rhode Island and Massachusetts, constitute the immense area of our coal deposits.

Anthracite. We have in the collection a single representative specimen from the coal mines of Rhode Island; and none from Massachusetts.

The Pennsylvania anthracites are well represented from several different localities. Among these is a very fine collection illustrating all the different varieties of anthracite from Schuylkill county. The specimens numbered (3 and 4), from the citizens of Wilkesbarre, illustrate, in a very striking manner, the character of coal, thickness of bed, &c., of the "mammoth vein," or "Baltimore vein." The column shown is a shaft nearly thirty feet high and five feet square. Several other large masses of the same coal were likewise shown; and also other collections of anthracite less noticeable, though representing equally valuable beds.

The present enormous and rapidly increasing consumption of anthracite, renders this mineral of extreme interest to the United States, but more particularly to the inhabitants of the Atlantic coast. The annual consumption at the present time is more than five millions of tons; and will probably reach nearly six millions for the ensuing year. This enormous rate of increase may be appreciated, when it is considered that in little more than thirty years, the amount has extended from 350 tons consumed in the year 1820, to considerably more than 5,195,000 tons consumed in 1853.* Even

* The amount consumed during certain years, and the rates of increase, as shown by the statistics, are about as follows:—

For the year	1820,	about	330 tons.	For the year	1840,	about	865,000 tons.
"	1825,	"	35,000 "	"	1845,	"	2,023,000 "
"	1830,	"	176,000 "	"	1850,	"	3,357,000 "
"	1835,	"	561,000 "	"	1853,	"	5,195,000 "

since the year 1845 the quantity has been more than doubled; and the probable amount required for the year 1855 will fall little, if any, short of 8,000,000 tons.

Valuable information and statistics relating to the coals of Pennsylvania is embodied in the Report of Dr. C. M. Wetherill on the Coals and Irons of that State, which report is given as an appendix to the next group (*i. e.* of furiferous minerals).

Bituminous Coal. The amount of bituminous coal consumed in the United States, though not readily ascertained, because much of it is not registered, can scarcely be less than three millions and a half of tons. We may estimate the present consumption of coals, therefore, at nearly 9,000,000 of tons, which, in ten years, would be more than quadrupled.

The coals of Indiana, Illinois, Iowa, and Michigan were not represented in the Exhibition.

Lias Coal. The official catalogue of the Exhibition shows no coal from the Richmond and Chesterfield basins in Eastern Virginia, nor from Deep River in North Carolina; the former of these has been proved to be valuable, and both belong to the geological period of the Lias.

A specimen of coal from Bellingham Bay, Puget's Sound (No. 219), appears in the Exhibition. Should this prove to belong to the age of the true coal measures, it will be of incalculable importance to the States upon the Pacific coast.

Lignite and Brown Coal. The Brown coals, or Lignites of the Tertiary and Cretaceous periods, though important in some parts of the country, are represented only in a single specimen from Brandon, Vermont, where this fuel has recently been discovered, and is used to some extent.

Graphite. The geological position of Graphite is in the metamorphic rocks, both of the Older series and those of the Palæoroic age. It occurs in large masses in the Gneiss of Worcester County, Mass., and at St. John's, N. B., and is probably due to the carbonaceous matter derived from the coal originally associated with the strata of this part of the country.

The large specimen (No. 22) in the yard at the Crystal Palace is from New Hampshire, probably from the town of Nelson, where several beds or veins of this mineral occur.

A bed of Graphite exists at Brandon, Vermont, which has been worked to some extent; and it occurs at other localities in that State. The specimen (No. 25) is from Wells River in Vermont. A bed of Graphite was formerly worked at Ashford, Connecticut. It is found at Amity, Orange County, New York, and other localities.

The specimens (Nos. 23, 24, and 25) are from near Ticonderoga, where a beautiful foliated variety of Graphite occurs in large quantities. As mineral specimens, and in small quantities, it is found in several places in the northern part of the State of New York.

Graphite occurs in Wake, North Carolina, in the same geological formation as in New York; and likewise near the Cowpens furnace in South Carolina. It is, doubtless, everywhere associated with gneiss and mica slate rocks throughout the extent of the newer metamorphic formation.

Graphite in valuable quantities has not been observed in the older metamorphic rocks of the Lake Superior region.

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1. Blackstone Coal Mining Company (E. N. Clarke, Agent, *Valley Falls, Rhode Island*).—Producers.

Specimens of anthracite coal and coal plants, quartz, and sandstone from the Company's mines at Valley Falls.

[The anthracite of Rhode Island and of Massachusetts is much less combustible than the anthracites of Pennsylvania, and bear evidence of having been subjected to a much higher metamorphic action; its lustre is plumbaginous.

"This collection of specimens illustrates the character of coals, slates, and fossil plants of the coal formation of Rhode Island, and merit an honorable mention." Jury Report.]

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2. Pennsylvania Coal Company, *Corner of Wall Street and Broadway, New York.*—Producers.

Large masses of anthracite coal from the Company's mines at Pittston, Pennsylvania.

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3. The Citizens of Wilkesbarre, *Lucerne County, Pennsylvania.*

Large masses of Wyoming Valley Anthracite.

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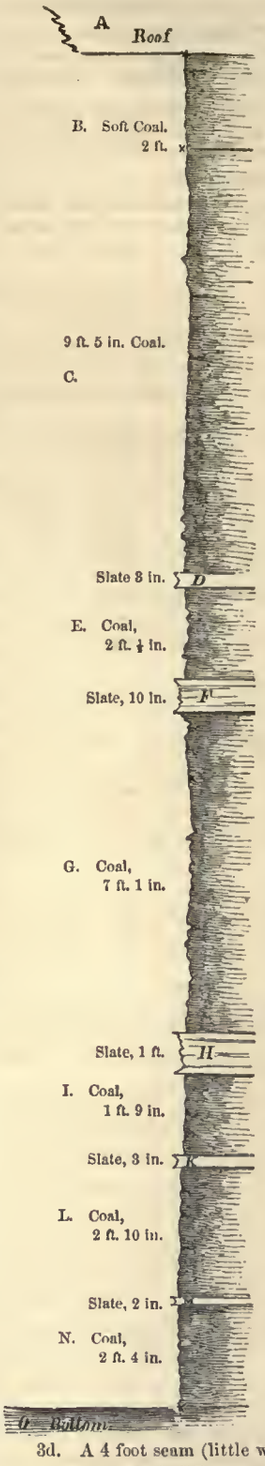
4. The Baltimore Coal Company.—Producers.

Large masses of anthracite, forming a complete section of a bed thirty feet thick, from the Company's mines in Wyoming Valley, near Wilkesbarre, Luzerne County, Pennsylvania.

By the kindness of Capt. Dana, of Wilkesbarre, an accomplished professional gentleman unconnected with the mines, we are able to present the following vertical section of "the Baltimore vein," made from minute measurements taken in the mine:

Section of the Baltimore Vein.

Scale 4 feet to an inch.



A. The roof or over-lying rock, varying from 3 to 15 and 20 feet in thickness; abounds in fossils, impressions of ferns, &c.

B and C are coal—the former 2, the latter 9 feet 5 inches thick. In places they are separated merely by a seam or fracture—in other places a thin stratum of slate shows itself, rarely exceeding 2 inches in thickness.

D. A slate 3 inches thick.

E. 2 feet ½ inch of coal.

F. 10 inches of slate.

G. 7 feet 1 inch of coal.

H. 1 foot of slate.

I. 1 foot 9 inches of coal.

K. 3 inches of slate.

L. 2 feet 10 inches of coal.

M. 2 inches of slate.

N. 2 feet 4 inches of coal.

O. The floor or under-lying rock is a brown silicious slate, running into sandstone—is thickly imbedded with iron nodules from 2 feet in diameter down.

RECAPITULATION OF COAL.

	Ft.	In.
B.	2	0
C.	9	5
D.	0	3
E.	2	0½
F.	0	10
G.	7	1
H.	1	0
I.	1	9
K.	0	3
L.	2	10
M.	0	2
N.	2	4
Total	29	11½

The following facts regarding the Wyoming coal basin are from an authentic source. This basin is in the form of a canoe (the form usual in the anthracite basins of Pennsylvania), thirty-two miles long by four and a half in breadth. It is protected by an elevated range of mountains, and seems entirely to have escaped the denuding wash and distortion visible in the deposits of higher regions. The primitive position of the vein is unchanged, as a consequence rendering their investigation and development greatly more easy, and less liable to the occurrence of those "faults" and "breaks" which have proved so disastrous to capital and discouraging to labor in other regions. This basin is underlaid by the following coal seams:

1st. A 3 foot seam (represented in a single section at the C. P.) of pure coal found at a depth of about 20 feet below the surface. In the presence of larger seams this is little worked, except by the farmers on their own lands for domestic uses.

2d. A 6½ foot seam (represented in two sections at the C. P.), 5 feet of pure coal, tender, and easily broken; the remainder 1½ bony. Average depth from surface 45 feet.

3d. A 4 foot seam (little worked, and not represented at C. P.), coal, where cut, of an indifferent quality. Average depth from surface 67 feet.

4th. A 9½ foot seam (represented in three sections at the C. P.), 7 feet of excellent coal, remainder bony. Distance from the surface about 105 feet.

5th. The great 30 foot seam already described. Average depth from surface 150 feet.

(The foregoing are all white ash coals, and Nos. 1, 4, and 5 esteemed at all the great iron manufactories on the Susquehanna and among private consumers as the best coals on this continent for the manufacture of iron for steam and domestic purposes.)

6th. A 19 foot seam of red ash coal. This is the underlying seam of the basin, and the most extensive in its out-crop, stretching from mountain top to mountain, more than five miles in width. Its basis is the pudding stone, below which no coals are found. It is esteemed superior coal for the manufacture of iron. Depth from surface 350 feet.

It will be seen from the foregoing enumeration of seams that the total thickness of all the beds in the Wyoming basin is twenty nine feet of coal, yielding (allowing a fair per centage for wastage and support to roof) at least sixty thousand tons to the acre. Distance from New York in an air line 120 miles.

The Jury of Class II. say, "they are sensible that too much praise cannot be expressed for the manifestation of the public spirit of the large column of coal and other large specimens from Wilkesbarre; and it would give them pleasure to make the highest award were this within the instructions to the Jurors. As such sections have an im-

portant geological interest, and are highly instructive, independently of the mere quality of the coal, the Jury would award in such cases the Prize Medal.

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5. Repplier & Brothers, *Philadelphia.*—Producers. Agents: Phillips & Oakley, 62 *West Thirteenth Street, New York.*

Anthracite coal from the Mammoth Vein Colliery, Norwegian Township, Schuylkill County, Pennsylvania. The coal at this locality is from 28 to 35 feet thick.

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6. Hollenback, G. M., *Wilkesbarre, Pennsylvania.*—Producer.

Anthracite coal, of a quality apparently equal to any other exhibited, and resembling the large specimens.

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7. Noble, Hammell & Co., *New York.*

A large mass of bituminous coal, from the Parker Vein, at George's Creek, Alleghany County, Maryland, forming a complete vertical section of the bed fifteen feet thick.

[This mass (and the following one) is from the semi-bituminous coal basin of Cumberland, in Maryland, which coals are much in request for ocean-going steamers as well as for iron smelting. The following analyses are, No. 1 by Dr. D. D. Owen, No. 2 by Professor W. R. Johnson:

	No. 1, Parker Vein Coal. 14 foot bed.	No. 2, Cleary Coal. 9 foot bed.
Moisture	0.04	0.07
Volatile matter	14.89	17.24
Earthy matter (ashes)	3.30	5.24
Fixed carbon	81.77	77.45
	100.00	100.00
Coke	85.07	80.24
Specific gravity	1.281	1.305

No. 2 is from the 9 foot bed five or six miles higher up the valley of George's Creek, in the same coal basin. Dr. Owen says, "the Parker Vein coal, in common with most of the coal of George's Creek Valley, in Maryland, takes the very highest rank in the whole list of American coals now in use, for purity, strength, economy, and efficiency."

For evaporating power, under equal bulks and weights, George's Creek coal stands at the head of the best American coals now in use, generating from 11 to 12 lbs. of steam at 212° Fahr., for one of combustible matter.

For heating-power, in a blacksmith's forge, compared with other bituminous coals, they take the highest rank, both of these coals being capable of forming from 18 to 20 links of chain cable, while Scotch coal only makes 10, the Liverpool 13, and the Newcastle 14 links.

The above statements supply conclusive evidence of the great superiority of Parker Vein coal, and explains fully why the Cunard line of steamers prefer the coal from this coal field to any American coals now in market, though they have yet to be furnished from the best bed and localities in this carboniferous basin.

Besides the main 14 feet bed on the lands of the Parker Vein Company, there are at least two workable beds above it and three below it, and intercalated with these latter there are from nine to ten beds of iron ore, varying from one to five feet in thickness.

From the aggregate thickness of all the coal beds (there are four or five workable seams), say 12 yards, and the weight of the coal, which averages about 53 to 54 lbs. per cubic foot, in the merchantable condition, and allowing for waste, we would have about 58,000 tons of coal, or 1,624,000 bushels in each acre; and as the beds of coal probably extend over at least 1,200 acres of the lands owned by the Parker Vein Company, in the George's Creek Valley alone, we have the approximate safe estimate of 69,600,000 tons of coal on this portion of the Company's property.]

"The Jury award for this specimen of coal, showing a section of the vein eleven feet high, a Prize Medal."

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8. Lonaconing Ocean Coal Mining and Transportation Company.—Producers. Agent: J. L. Graham, *Metropolitan Bank, New York.*

Large mass of bituminous coal, from the Company's mines at George's Creek, Alleghany County, Maryland, forming a complete vertical section of the bed, being fifteen feet thick.

[This column of coal measures 14 feet 6 inches in height, and 3 + 3 feet, and is a shaft cut with the design of showing the actual vertical section of the large vein of the Cumberland region.

It was taken from an opening upon the property of the Lonaconing Ocean Coal Mining and Transportation Company, situate a little to the east of the central or synclinal axis of the basin, and therefore at a point where the dip of the strata was but slight, and consequently a good position to display the true nature of this valuable deposit.

The property of this Company lies upon both sides of the synclinal axis, and being cut through by the valley of George's Creek, at a little distance from this line, a singular advantage for mining operations presents itself, in an easy access to both slopes of the basin.

The point where it is contemplated to commence openings upon this property will give access to an area of about 800 acres of the 14 feet vein, and openings upon the opposite side of the basin will relieve 1,400 acres more, making a total of 2,200 acres.]

"For great size of specimen, being a column of fifteen feet high, exhibiting a section of the seam, the Jury award a Prize Medal."

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9. Morrow, John H., *King's Creek, Hancock County, Virginia.*

Bituminous coal from King's Creek.

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10. New Creek Coal Company.—Producers. President, Alfred Ashfield, *New York.*

Coal from the Company's mines in Hampshire County, Virginia.

[This coal is of the same quality, and probably from the same beds, as the semi-bituminous coals of the Parker Vein, George's Creek Company, before mentioned. Major Douglass says, in his report on the coal of this basin, that "as an agent for the generation of steam it is ascertained to be more efficient than either the anthracites, on the one hand, or the fat bituminous coals on the other." It is remarkably free from sulphur, and produces 75 to 85 per cent. by weight of a very porous, strong, and silvery-white coke. The superiority of the coals of this semi-bituminous region for ocean steam navigation has already been noticed.]

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11. Barney, D. W.

Specimens of coal, iron ores, and other minerals, from localities on or near the Scioto and Hocking Valley Railroad, in Perry, Hocking, Vinton, and Jackson counties, Ohio.

[The thick coal of this region (bituminous) is seventeen feet thick at Straitsville, Perry County, and is associated with numerous minor beds of coal, deposits of iron ore, buhr stone, black marble, &c.]

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12. Trabue, Isaac H., *Hawesville, Kentucky.*—Producer.

Coal from Peacock Vein, four feet six inches wide.

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13. Ottinger, Capt. D., *United States Marine.*

Specimens of coal from Puget's Sound, Bellingham Bay.

[This coal has the appearance of ordinary bituminous coal, and is in large masses. Should it prove to be abundant, and of good quality for steam navigation, its value to the Pacific coast of America is incalculable.]

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11. Breckenridge Cannel Coal Association. (Treasurer, John Thompson, *corner of Wall Street and Broadway, New York.*)—Producers.

Specimens of cannel coal from the Company's lands in Breckenridge and Hancock counties, Kentucky.

[This cannel coal is peculiarly rich in bituminous matter; the bed is three feet in thickness, and extends under at least 4,000 acres of the Company's lands, lying nearly horizontal, with a dip of about four inches in one hundred feet, to the south-west. It is the upper bed of the region; a bed of five feet of ordinary bituminous coal being about one hundred and fifty feet beneath it (probably the same vein that furnishes the specimens No. 12). It resists atmospheric influences to a remarkable extent, and possesses such strength and tenacity that it suffers no loss by transportation, or by long exposure in the open air. It ignites with the greatest ease, giving a flame of uncommon volume and endurance. Professor Silliman gives for its analysis:

	I.	II.
Gas	60.27	63.52
Fixed carbon	31.05	27.16
Ash	08.66	08.47
Moisture	—	00.77
Total	99.98	99.92
Coke	39.71	35.63
Density	01.15	—

This coal is eminently electrical on friction, in which respect it is peculiar, only the "Albert coal" of New Brunswick, and one or two others, having this characteristic so far as has been observed. Notwithstanding its remarkably high per centage of bituminous matter it yields nothing to the action of solvents. It might be called jet coal, as it is readily wrought in the lathe and by tools into objects of art. Its position is nine miles from the Ohio River, to which it is transported on a railroad.]

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15. Callaway Mining Company, *Coté sans Dessin, Callaway County, Missouri.*—Producers. Agent: Isaac S. Clarke.

Cannel coal from the Mastodon Cannel Coal Mines, Calloway County, Missouri.

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16. Smith, Dr. Crawford E., *Arrow Rock, Saline County, Missouri.*

Cannel coal from Arrow Rock.

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17. Western Virginia Coal Mining Company, *Kanawha County, Virginia.*—Producers. Agent: W. H. Peet, 5 *Bowling Green, New York.*

Very superior cannel coal.

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18. Oakley Richard, 51 *William Street, New York.*

Cannel coal from Little Coal River, Kanawha County, Virginia.

[These specimens (the last two) of cannel coal are from mines in Western Virginia, where this kind of coal, of excellent quality, occurs in numerous localities. The beds are usually thin, but its superiority for domestic and other purposes causes it to be in demand at much greater prices than the ordinary bituminous coals. The mines at present wrought in the Western country fall very far short of furnishing a supply for the home market.]

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19. ———

Specimens from Vinton County, Virginia; Vinton County cannel coal, from a vein four feet thick; bituminous coal, from a vein four feet thick; buhrstone, clay-ironstone, and limonite.

20. Howell, William T., 181 *Market Street, Philadelphia.*—Producer.
Cannel coal from Mount Nebo Mine, Mahoning County, Ohio.

21. Chesapeake and Ohio Steam Transportation and Mining Company.
Coke.

[Coke is the residue left after the distillation of bituminous coal. In the United States, on account of the cheapness of charcoal and other causes, coke is not manufactured to any considerable extent, except as a collateral and subsidiary product of the gas manufacture. The coke left behind in the gas retorts, after the expulsion of the volatile ingredients of the coal, is found by experience to be the best of all fuels for heating the gas retorts themselves, and is therefore used for this purpose. It is found, however, that the whole quantity produced is not consumed in this way. In England, and on the continent of Europe, coke is manufactured on a very large scale for its own sake, being produced to a very great extent from the "breeze," or small coal of the mines, for manufacturing and domestic purposes, and for the generation of steam in locomotive engines.]

22. Seabury, J. & J. L., 156 *Chrystie Street, New York.*—Producers.
Graphite, a large mass, weighing 1,000 lbs., from a mine in New Hampshire.

[This plumbago contains a portion of iron pyrites, which diminishes its value.]

23. Waddell, William H. C., *New York City.*
Graphite from Ticenderoga, Essex County, New York.

24. Arthur, William, *Ticonderoga, New York.*
Graphite from Ticonderoga.

25. Blake, William P., *New York City.*
Graphite, in fine laminated and lustrous masses, from Ticonderoga—remarkably fine mineralogical specimens, as showing distinctly the crystalline form of the species.

[The plumbago from this locality is not firm enough to admit of being sawn into slabs, as it splits in the direction of its laminæ. Since the discovery, however, that graphite, in fine dust, can be consolidated by heat and pressure in iron moulds into any desired form, it is no longer so important as formerly to obtain it in masses of great solidity, like that from Borrewdale, in Cumberland.]

25a. McLeran, E., *Wells River.*
Large specimens of graphite from Wells River.

[Graphite is one of four familiar forms of carbon. Chemically identical with the diamond, the hardest of all bodies, graphite is itself one of the softest. Differing from it in density, hardness, and crystalline form, perfectly opaque, while the diamond has the most lustrous transparency, they agree only in that when burned they both form carbonic acid with oxygen. Coke and charcoal ignite, as everybody knows, with the greatest ease, while diamond and graphite demand the chemist's most active agencies to effect their combustion. "Gas carbon," a product of the decomposition of coal gas, and deposited on the roof of the retorts where the coal is coked, is another form of carbon, differing from charcoal and coke in that it has no porosity, is much finer, more hard, and very incombustible. Probably the cause of the difference in the combustibility of the several forms of carbon is to be found in the difference of porosity, as well as in the condition of the molecules. All forms of carbon, save the diamond and some anthracites,* are good conductors of electricity; for this reason, and because of this infusibility and ability to resist combustion, they are much used as the poles or terminal points of communication in voltaic piles. Bunsen, in Europe, and Silliman, Jr., in America, about the same time demonstrated the advantages of employing carbon, either native plumbage or coke, as the material for the negative element of voltaic piles.

The several forms of carbon may by artificial means be produced the one from the other. Dumas, by an intense heat, turned the diamond into coke. Silliman, Sen., thirty years ago, demonstrated the volatility and fusibility of carbon by the galvanic focus; a fact which, although often denied, has been re-affirmed lately, and confirmed by new and surprising experiments by Despretz, who states, that carbon, when solidified after fusion, is found converted into graphite. Despretz, in his experiments, has found that the carbon deposited from vapor assumes the octahedral form, and has the hardness of the diamond—being, in fact, minute black diamonds. Hitherto all attempts to form the diamonds (as a gem) artificially have entirely failed. It is well known in certain conditions of the ordinary high furnace, that the pig metal is highly charged with graphite, which the iron dissolves in large quantities, and that even the slags contain tufts of lamellar crystals of this substance in cavities, as if deposited from a state of vapor. The surface of gas carbon next to the iron retort has, as was first shown by Despretz, a thin crust of graphite. It is possible that the ultimate particles of all the several forms of carbon may be equally hard, and that the different efficiency of these substances as cutting agents is due in a great measure to the state of aggregation. It is well known that the dies of ruby through which the "leads" of ever-pointed pencils are formed, are very soon cut to pieces by the action of the graphite. Next to the diamond, the ruby is the hardest known mineral.

The results of Deville lead us to anticipate the possibility of obtaining, by the combustion of the denser forms of carbon in our ordinary blast furnaces, degrees of heat heretofore attributed solely to the oxyhydrogen blowpipe or the galvanic focus. This French chemist has recently succeeded, by means of a small table blast-furnace, fed with the cinders produced by the imperfect combustion of bituminous coal, in producing effects, previously considered impossible, with such means, namely, the fusion of platinum and silica.

The uniform occurrence of graphite in rocks of highly metamorphic character leads us, in view of the observations of Despretz, almost irresistibly to the conclusion (whatever may have been the source of the original carbon) that it owes its graphitic form to the action of heat. One cannot keep out of mind, when considering this subject, the facts presented in the anthracites of Pennsylvania, which become more and more completely anthracitic in proportion as they occupy the zones of greatest metamorphic action and geological disturbance; again, passing to the anthracite beds of New England, we find, with a still higher plutonic agency, a remarkable likeness in the coal to gas carbon, with a graphite-like lustre; while at St. John's, in New Brunswick, where the sedimentary rocks have lost all traces of fossil vegetation, and are become quite crystalline, we see vast beds of graphite, the probable representatives of former beds of fossil coal.

The economical value of graphite is in its use for black lead* pencils, melting pots of a refractory nature, and as a polish for iron stoves. It has also been used with success as a substitute for oil, in the lubrication of chronometers and fine machinery, and more lately for the axles of railway carriages. Its impalpable dust is also employed as the means of giving conducting power to the surface of electrotype moulds of wax, enabling the battery to deposit the copper evenly and quickly over the whole surface.]

* The opinion that anthracite is the coke of bituminous coal, deprived of its bituminous matter by plutonic agencies, during the upheaval and contortion of the anthracite basins, is very general. Professor Silliman, Jr., has lately shown that out of about eighty different specimens of anthracite from Pennsylvania which he has examined, a majority are conductors of electricity. The anthracites of New England are superior in conducting power to coke, and equal to graphite. Those of Pennsylvania are less perfect conductors, this property being connected, no doubt, with the amount of metamorphic action to which they have been subject.

2. *Ferriferous Minerals and Products.*

GENERAL OBSERVATIONS.

During the last two or three years the manufacture of iron in the United States has grown with remarkable rapidity, and has been attended with the most brilliant commercial results. As a consequence the public attention has been directed towards the development of this industry in a way and to an extent before unknown in this country.

The great demand for railway bars, to supply the rapidly extending system of our internal connections, has stimulated, probably more than any other cause, this important branch of national wealth, while the general prosperity and rapid growth of the country give every reason to hope that this now firmly established business will maintain its progressive character under all changes of national policy.

Iron Ores.—The principal ores of iron in the United States, in the order of their value and importance, are: (1) the *magnetic ore* (magnetite Fe O $Fe_2 O_3$), consisting of the protoxyd and per-oxyd of iron; (2) *specular iron*, a per-oxyd of iron, including the crystalline form, the micaceous iron ore, red iron ore, jaspery iron ore, and red argillaceous iron ore; (3) *brown iron ore*, or *brown hematite*, a hydrous per-oxyd of iron, including bog ore and ochreous iron ore; (4) *carbonate of iron*, or *spathic iron*, including much of the clay ironstone of the coal measures, as well as the sparry or crystalline form; (5) *chrome iron*, or *chromic iron* (valued for its chrome rather than for its iron).

Geological Relations.—The iron ores of the United States, so valuable and abundant, are, in some of their different varieties, found (with a few important exceptions) in nearly every geological formation, and for the most part follow the extent and geographical distribution of each.

The *magnetic iron* ore (Fe O_1 $Fe_2 O_3$), in its geological relations, is confined to the older and newer metamorphic formations of the United States. The chief repository of this ore is in the sienitic gneiss of the older metamorphic formations. It occurs, likewise, in less quantities in the gneissic and granite rocks, as also with the talcose slates and serpentine rocks of the newer metamorphic period. It is found in isolated crystals (and, perhaps, larger masses), in the chloritic and hornblende slates, and in the epidotic rocks of the same formation. So far as yet found, none of the beds or veins of magnetic ore in the newer metamorphic formations have proved of equal magnitude or importance with those of the older metamorphic rocks. In its geographical distribution, however, this ore of iron may be regarded as coextensive with the metamorphic formations of the United States.

The magnetic ore occurs often mechanically intermixed with the specular ore in the same bed, and either one or the other may predominate in different localities.

The magnetic ores of the older metamorphic rocks are represented in several collections of the ores and furnace products from Clinton and Essex counties in New York. Large masses, and smaller specimens, of the mixed magnetic and per-oxyd, with iron made therefrom, are shown from two localities on the south shore of Lake Superior viz., Marquette and Jackson Mountain. Large masses of the mixed magnetic and per-oxyd of iron are shown from the Pilot Knob and Iron Mountain, Missouri.

A collection of specimens of magnetic iron ore is exhibited from the Sterling Mines in Orange County, New York. Similar ores are also exhibited from several localities in New Jersey, from more numerous places in Pennsylvania, and from a single locality in Maryland.

The magnetic and micaceous iron ores of the newer metamorphic rocks which occur in Maine, New Hampshire, and Vermont, in workable beds, with few exceptions, are not represented in the Exhibition. Notwithstanding that rocks of this age are the fundamental formation of the whole of New England, not a single specimen of iron ore has been presented, except one of the porphyritic ore from Rhode Island, which is not enumerated in the Catalogue,† and a few from New Hampshire shown as mineral specimens.

* It seems hardly necessary to remind even the unscientific reader that this term is a vulgar misnomer. Plumbago contains no lead.

† In speaking of the deficiencies in this collection, and the absence of representatives of important ores and other materials from different portions of country, it is not to be understood that the writer censures or underrates what has been accomplished. On the contrary, he offers his willing testimony to the zeal and ability with which this part of the Exhibition has been managed. It was impossible in the space of a few months to do more, and our surprise is rather that so much has been accomplished, than that

The *specular iron* ore, or per-oxyd of iron, either in its crystalline form, or as micaceous and red iron ore, is likewise associated with metamorphic and igneous rocks. The principal valuable deposits of this ore, as of the magnetic ore, in the United States, are connected with the older metamorphic rocks.

The specular and red ores, which are abundant and very important in St. Lawrence and Jefferson counties, New York, and which are rapidly becoming of mere value in the manufacture of iron, are unrepresented as metallurgical specimens, but have a place among crystallized specimens in the cabinets of private collectors exhibited in the Palace.

Neither magnetic nor specular iron ores are shown from any point south of Maryland; though the metamorphic formations which contain them are largely developed as far south as Alabama, and contain valuable beds of iron ore throughout the greater part of their extent.

The geographical distribution of the magnetic and specular iron ores in the United States follows the metamorphic formations from the north-eastern part of Maine, and from northern New Hampshire, Vermont, and New York, southward parallel with the coast of the State of Alabama. In a westerly direction from northern New York we take up the line of the same formation on the south side of Lake Superior, where, as just pointed out, it abounds in iron ores; and in the south-west we have the same formation in Missouri and Arkansas.

Red Argillaceous (specular) Iron Ore.—Following the subject of iron ores in the order of their economical importance, we shall next consider the ores of the Silurian, Devonian, and Carboniferous rocks.

The ore first to be noticed in importance is a red argillaceous, or calcareous per-oxyd of iron, of concretionary structure, sometimes termed lenticular, or oolitic iron ore. It occurs in the upper silurian rocks of Herkimer, Oneida, Wayne, Cayuga, and Monroe counties, New York, in beds, associated with limestone, shale, and sandstone mostly of the Clinton group, or No. V. of Pennsylvania. The same ore occurs in Juniata, Franklin, Columbia, Dauphin, Perry, and Union counties, Pennsylvania, and extends through the States farther south as far as Alabama; it exists also in Wisconsin.

This iron ore is represented from three or more localities in Pennsylvania and from one or two in Maryland. Although occurring in large quantities in Oneida, Cayuga, and Wayne counties, in New York, it is entirely unrepresented, nor is it represented from Virginia, Alabama, or Wisconsin, where it is known to exist in large quantities.

The argillaceous iron ores, or fossiliferous per-oxyd of iron from the Devonian and lower part of the carboniferous periods, are represented from a few localities in Pennsylvania. Although known to exist in the same geological formations in Virginia and farther south, these ores are not represented from these States.

The brown hematite (limonite) of the Tertiary formation is a deposit of great importance. It occurs very extensively in connection with an older Tertiary formation, which, from the northern part of Vermont, runs parallel to the Green Mountains and Alleghany chain, through the western part of Massachusetts, New Jersey, Pennsylvania, Maryland, and Virginia, and probably as far south as Alabama. The hematite is usually compact, fibrous, and stalactitic, and always more or less enveloped in clays of various colors. The Tertiary formation is the principal source of the iron ores of this character in the United States, and large quantities of excellent iron are manufactured from them in Vermont, Massachusetts, New York, Pennsylvania, and Maryland.

These ores are represented at the Exhibition in collections from Branden and Bennington, Vermont; from Salisbury, Connecticut; from North-East, New York; from numerous localities in Pennsylvania, and from several in Maryland.

Compared with their value and importance, and regarding their wide distribution, Pennsylvania is the only State presenting a fair exhibition of the ores of this formation. While in Massachusetts the formation extends through the whole State from north to south, and is very extensively used in the manufacture of iron, the State is entirely unrepresented. South of Maryland we have no collections or specimens of the iron ores of this formation, though they exist in large quantities.

Ochreous iron ore, or the iron ores of this kind disseminated through clays, are abundant in the same association. The mixture with clay occurs in all proportions, and they may be in some places rich enough to be used as iron ores, in others they simply afford the coloring matter to the clay, and exist in all the intermediate gradations of proportions.

Specimens of brown iron ore are exhibited from near Richmond, Virginia.

Bog-iron ore, which is extensively distributed in the United States, belongs to the drift, or modern alluvial formation. It occurs in numerous localities, and is sometimes of great importance when in proximity to other ores, for the purpose of mixing with them. This ore was scarcely represented in the collections at the Crystal Palace.

Carbonate of iron, and crystallized spathic iron, occur in quantities only in a few localities in the United States. The chief repository of this ore is in the metamorphic strata, and a bed or vein of considerable extent exists in Connecticut (represented in the collection). It is also known to occur in large quantities in a few localities in Massachusetts and Vermont. In small quantities this ore may occur in any of the sedimentary rocks which are unaltered, particularly when organic remains are present.

The clay iron ores, the argillaceous carbonates of iron, and the brown iron ores resulting from the decomposition of the latter, are extremely abundant, and widely diffused throughout the coal formation of the United States. These are represented from numerous localities in Pennsylvania, and from several places in Maryland, particularly a fine collection from the Mount Savage Iron Works. A few specimens from Jackson County, Ohio, also collections from three localities in Missouri, and one collection from Alabama, complete the exhibition of these ores.

Thus we see that while these iron ores follow the great geographical extent and distribution of the coal formation in Virginia, Tennessee, Kentucky, Illinois, and Iowa, those States are entirely unrepresented; Ohio, Missouri, and Alabama are but meagrely represented, compared with the extent and importance of those ores and their manufacture. In this department Ohio holds a very prominent position. Large quantities of iron are likewise manufactured from the ores of the coal formation in Tennessee. The iron manufactures of Alabama are already important, and its ores are derived from the coal formation as well as from more ancient rocks.

Franklinite, which consists of oxyd of iron combined with oxyd of manganese and zinc, deserves notice in this place. The only locality where it occurs in quantities to be of economical importance, is in Sussex County, New Jersey. It is here associated with metamorphic rocks. Iron and steel of excellent quality have been manufactured from this ore; and the quantity existing in the mines of New Jersey promises to make it an ore of great importance in the manufacture of iron.

Chromic iron ore, chromate of iron, is associated with the serpentine rocks of the newer metamorphic formations of the United States. In this association it extends from the northern part of Vermont, through Massachusetts, Connecticut, New Jersey, Pennsylvania,

Along this range it is known in numerous localities, among which are Newfane and Westfield, Vermont; Chester, Massachusetts; Milford, Connecticut; Hoboken, New Jersey; Lancaster, Pennsylvania; Bare Hills, near Baltimore, and in Cecil and Montgomery counties, Maryland, &c.

The representations of this wide distribution of chrome iron ore were from Lancaster County, Pennsylvania, and Anne Arundel County, Maryland, the other States presenting no collections of this ore.

The serpentines of the older metamorphic rocks do not contain chrome iron ore.

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26. Root, Albert, 80 *Wall Street, New York.*

Magnetite ore from Fort Ann, Washington County, New York, and pig-iron made from it.

Iron ore from Lawrence County, Ohio, and pig iron made from it.

Cannel Coal from Jackson County, Ohio, and bituminous coal from near Ironton, Ohio.

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27. Witherbee, S. H. & J. G., *Port Henry, Essex County, New York.*

1. Magnetite iron ore from "New Bed," Moriah, Essex County, New York, about five miles west of Lake Champlain. This deposit is about 40 rods long, from 6 to 18 feet thick, and dips to the west; the ore is used extensively in Northern New York and Vermont for making bar-iron and blooms.
2. Magnetite from Fisher Ore-bed, about a mile north of the last—from its superior quality used for making railroad axles.
3. Magnetite from a very large deposit called "Old Bed," about half a mile east of New Bed.
4. Magnetite containing phosphate of lime.

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28. Lockwood, M. J., *Sing Sing, New York.*

White marble, actynolite, quartz crystals, *magnetite*, calcite, copper pyrites in calcite, soft iron made from the ore, from Sing Sing and Clinton prisons.

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29. The Association for the Exhibition of the Industry of all Nations.—Proprietors.

(1). Collected by Dr. F. A. Genth, of Philadelphia, Pennsylvania.

a. Iron ores from Cheever Ore-bed, Port Henry, Essex County, New York:

1. Specimens of best ore, consisting of pure magnetite.
2. Specimens of average ore, consisting of magnetite mixed with quartz.
3. Specimens of lean ore, magnetite with hornblende.
4. Iron ores from Goff Ore-bed at the same locality.
5. Rich ore, nearly pure magnetite.
6. Lean ore, mixture of magnetite with apatite.
7. Dressed ore, consisting of pure magnetite.

b. From Crown Point, Essex County, New York:

1. Pure crystalline magnetite, a rich iron ore, from Thompson's Ore-bed.
2. Magnetite containing garnet, called "red ore," from same ore-bed.
3. Average ore from Penfield, Harwood & Co.; magnetite containing a little quartz.
4. Rich ore from ditto.
5. Magnetite, with hornblende.
6. Slags, bar-iron, steel made from it, and horse-shoes.

c. From the Crown Point Iron Company, Crown Point, Essex County:

1. Specular iron ore, with quartz.
2. Average ore, limestone flux, and pig-iron.
3. Crystalline pig-iron.
4. Refined iron, bar-iron, nails, malleable castings, and steel.
5. Slags from blast furnace and refining furnace. The iron is made with a hot-blast in a charcoal furnace.

d. From the New York State Prison at Clinton:

Magnetite iron ores, dressed and undressed, and iron made from them.

e. From Lawrence Myer's Forge, at the Forks of the Saranac, New York:

1. Sienite.
2. Sienite, with magnetite iron ore.
3. Rich ore and dressed ore.
4. Bar-iron.
5. Bar-iron, hammered until cold.
6. Piece of a car-wheel axle.

there are still deficiencies; and nothwithstanding these, the collection presents a better exhibition of the resources of the country than is to be found in any cabinet in the United States. What we greatly need in this country is a collection giving a full and comprehensive view of our economical resources in their just and proper light; and the writer has supposed that he may render goodservice by pointing out the deficiencies in this hastily formed collection, that while it remains in the Exhibition means may be taken to more fully represent the economical resources of our country. And it is to the interest of all to have the economical products of importance represented here, that fair and just comparisons may be made, or at least that unjust and invidious comparisons may be avoided.—H.

7. Slags.

[The ores of Northern New York have long been famed for producing iron of excellent quality. A large establishment for the manufactory of blooming iron has been successfully carried on for many years at Clintonville, Clinton County, also at Keesville, in Clinton and Essex counties. Numerous smaller establishments have also long existed in other parts of these counties. More recently furnaces have been established at Port Henry, West Port, Crown Point, and other places, and large quantities of pig-iron have been produced for many years past.

The extensive deposits of this ore at the Adirondack mines, about the sources of the Hudson River, are used in the manufacture of iron and steel. A series of ores, steel bars, and implements of steel, from the manufactories of this locality, received a prize medal in the London Exhibition of 1851.

The extensive range of country occupied by the older metamorphic formations in Northern New York, the numerous beds of this ore already known, and the frequent discoveries of new localities of the same, promise to render this portion of the country one of the most important in the United States for the production of this excellent quality of iron ore. The increased facilities of transportation will readily and cheaply bring this ore to the lower valley of the Hudson, where it may meet the coal from the anthracite basins of Pennsylvania.]

f. From Elba Furnace, Carroll County, Maryland. Iron ores, &c.:

1. Magnetite ore from Mineral Hill.
2. Limonite ore from Mount Airy.
3. Argillaceous ore from Baltimore.
4. Limestone flux (contains hair-brown tourmalines) from Mariettaville.
5. Gray and white pig-iron, made by cold-blast with charcoal.
6. Gray pig, cast upon an iron plate.
7. Slag from gray pig.
8. White pig metal, made by hot-blast with coke.
9. Slag, from the last.

g. From the Carroll Mines, near Sykesville, Carroll County, Maryland:

1. Specular iron in quartz.
2. Magnetite with epidote.
3. Erubescite in quartz.

(2.) Collected by Professor O. P. HUBBARD, of Dartmouth College, Hanover, New Hampshire.

a. From Tyson's Forge, Plymouth, Vermont:

1. Magnetite in dodecahedral crystals.
2. Spathic iron, roasted, same locality.
3 & 4. Green, brown, blue, and white slags.
5. Limestone flux.

b. From Franconia Furnace, Franconia, New Hampshire:

1. Magnetite, with epidote and hornblende.

[*Magnetite*, or magnetic iron ore, is the richest of all the ores of this valuable metal, yielding 72.40 of iron. It is, properly speaking, a double salt, composed of one equivalent of protoxyd and one of per-oxyd of iron $FeO+Fe_2O_3$. It occurs in prodigious abundance in Northern New York in extensive beds of inexhaustible extent. Mingled with specular oxyd of iron it abounds on the south shores of Lake Superior and in the well-known Iron Mountain and Pilot Knob of Missouri.

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30. PATTERSON, SMALLS & Co., *Ashland and Oregon Furnaces, Betts County, Maryland.*—Producers and Manufacturers.

Specimens of Maryland iron ores and limestone fluxes.
Magnetite ore from McComas bank, Baltimore County.
Limonite ore " Scott " "
Magnetite ore " Norris " "
Limonite ore " Oregon " "
" " Timonium " "
Limestone " Texas " "
" " " " "
Silicious iron ore from Bell bank, Harford County.
Quartz conglomerate from Raush Gap, Lebanon County, Pennsylvania.

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31. AMES, OLIVER, & Co., *New York.*

Magnetite iron ore from Wawayanda, New Jersey.

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32. TOWNSEND, WILLIAM H. & PETER, *Sterling Works, Orange County, New York.*—Manufacturers.

Sterling iron ores; pure magnetite from Jennings Hollow Mine; magnetites, very nearly pure, from Lake Mine, from California Mine, from House Vein, from Alice Vein, from Conklin Mine, from Old Sterling Mine, from Old Kane Mine, from Oregon Mine, from Crossway Mine, from Belcher Mine, and from other places; specimen of the hanging wall of Oregon Mine; specimens of slags, and a large piece of feldspar.

[These ores present some slight differences from those of the northern part of the State, but are equally productive of good iron. The ores from the mines in Orange County have long been known and appreciated. They were many years since transported to several furnaces along the Hudson River, and are used at the foundery near West Point for the manufacture of cannon, &c.

Collections of similar ores are exhibited from several localities in New Jersey, where iron has been extensively manufactured from them for a long period. The magnetic ores of Pennsylvania are likewise very important, but in the Exhibition bear a small proportion to the other ores presented from that State.]

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33. TAYLOR, A. S., *Clinton, New Jersey.*—Producer.

Three varieties of magnetite iron ore from the property of the exhibitor at Clinton. These ores are from three distinct veins lying parallel to and but a few yards distant from each other. They are from 3 to 16 feet in breadth, and are now yielding 25 tons of ore per day. They were worked seventy years previous to the American Revolution, and supplied the ore for the old Union Furnace until the time when it went out of blast (about the year 1778).

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34. COOPER & HEWITT, 17 *Burling Slip, New York.*—Manufacturers.

Micaceous specular iron ore; magnetite ore, nearly pure, mixed with a little calcite and a little specular iron, from Andover, New Jersey; pig iron and slags.

[An instructive and well-arranged collection from one of the most successful furnaces in the United States.]

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35. JAMES, WM., & Co., *Maramec Iron Works, Crawford County, Missouri.*—Manufacturers.

Specimens of nearly pure specular iron ore; specular iron in minute brilliant scales, forming a mass, which smears the fingers like a bronze powder; pig iron; specimens of bar iron, twisted and bent cold.

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36. MADISON IRON AND MINING COMPANY, *St. Louis, Missouri.*—Producers and Manufacturers. (L. V. BOGY, President, *St. Louis.*)

Large masses of *nearly pure* specular iron ore from Pilot Knob; unrefined iron made from this ore by the Catalan process; cold-blast iron; hot-blast iron; hot-blast chilled iron; specimen of specular iron ore from one of the Company's Iron Mountains, Pilot Knob, Missouri, an inexhaustible deposit; slags from hot-blast, cold-blast, and forge iron; specular iron from Bogy Mountain, about five miles from Pilot Knob.

[The large and fine specimens of mixed magnetic and per-oxyd (specular) of iron in the yard, from the well-known Iron Mountains of Missouri, attracted well-deserved attention. These deposits are probably the most remarkable at present known in any country.

This portion of Missouri has been often described. The geological formation is of the older metamorphic rocks, and the supply of ore may be regarded as inexhaustible. It lies along the southern margin of the great coal field of Iowa and Missouri; and its proximity to illimitable supplies of mineral fuel and to the poorer ores of the coal formation, render this one of the most important iron regions in the United States. Though now on the western frontier of our civilization, it will one day be the great centre of a region where all the means for the highest agriculture, the avenues for commerce, and the resources of manufacturing industry exist in the fullest degree possessed by any country on the globe.

Pilot Knob, and the other similar hills which constitute what are called the "Iron Mountains" of Missouri, are situated about ninety miles south of St. Louis and about fourteen miles from the La Motte lead mines. Pilot Knob is a conical hill about 700 feet high, of an appearance so peculiar that it served for a land-mark before the settlement of the country, from which circumstance its name is evidently derived. From about half way up this hill to the top, its whole mass, as nearly as can be determined from the exterior surface, is composed of specular iron in immense blocks. The ore is both massive and micaceous, and vast quantities of ochreous red oxyd are also found. Another of these hills is said to cover a surface of 500 acres, to be 250 feet high, and to be wholly composed of small masses of specular iron, closely packed together, the interstices being filled with a brown clay. How far the formation extends beneath the surface, it is of course impossible to tell. The iron made from these ores is generally of good quality, some of it however being somewhat red short. The mining and smelting operations which have been heretofore carried on in this region, owing to the newness of the enterprise, want of facilities of communication with the proper markets, and other causes, are wholly unworthy of the magnitude of the interests involved.

The associated rocks are porphyritic and quartzose granite, the whole obviously the result of igneous causes, and upheaved from below. The origin of such immense masses of nearly pure specular iron ore is a subject of curious inquiry.]

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37. ELY, H. B., *Marquette, Michigan.*

Specular and magnetic iron ore from the Iron Mountain of Michigan.

[These ores, from the south shore of Lake Superior, are from the metamorphic rocks of the same age as those of Northern New York, and are known to occur in inexhaustible quantities. The points mentioned are near the lake shore; but the belt of the formation containing these ores extends far toward the Mississippi River; and large quantities of this iron ore are known at numerous localities between the points mentioned and the western extremity of Lake Superior. As the country south and south-west of the great lakes shall become more fully inhabited, and manufacturing enterprises be undertaken, this iron ore of the northern peninsula of Michigan and of Northern Wisconsin, will be transported southward to meet the fuel of the great western coal basin, and it is thus destined to become an important element in the future advancement of the Great West. The specimens next mentioned are from the same region.]

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38. THE SHARON IRON COMPANY, *Sharon, Mercer County, Pennsylvania.*—Proprietors and Producers of Iron Ore and Manufacturers of Iron Nails, &c.

Three large masses of specular iron ores (magnetite) from the Jackson Iron Mountain, Lake Superior; specimens of Lake Superior iron.

[This ore is found on the south shore of Lake Superior, in the State of Michigan, upon section No. 1, in township 47, north of range 27 west, as surveyed by the government, in latitude 46° 30' north, and longitude 87° 58' west. It was discovered in 1845, by Major James Ganson and others, under the guidance of the Chief of the Chippewa Indians. The discoverers were citizens of Jackson County, in the State of Michigan, and the mine was named by them the "Jackson Iron Mountain." That portion of the upper peninsula of the State was then an unbroken and wholly unexplored wilderness. A few small specimens of the ore were brought away by the original discoverers and analyzed by Doctor John McLean, of Jackson, since which time the mine has been frequented and explored by the curious, and worked to that limited extent permitted by the obstacles of a new and rugged country. Within two years, this mine having fallen into

the hands of the Sharon Iron Company, has been worked with more vigor, and the road, now in process of construction, from the mine to the harbor at Iron Bay, in connection with the ship canal around the Falls of the Ste Marie River, will soon open this mine to easy and cheap access.

ANALYSIS OF ORES.

Ore from the Eastern part of the Jackson Iron Mountain, Lake Superior.—This is a very fine-grained variety, of great purity and solidity.

Metallic iron	70.23
Oxygen	29.54
Insoluble	00.19
	99.96

Slaty Ore from the same Section.—It is found westwardly from the above specimen—is slaty in its structure, and more easily mined than any other portion of the mountain.

Metallic iron	69.09
Oxygen	29.09
Insoluble	1.64
	99.82

Massive, or Crystalline Ore, from the same Section.—This is a coarse ore, composed of associated crystals, in some instances adhering so slightly that they may be separated with the point of a knife.

Metallic iron	68.07
Oxygen	29.06
Silica	2.89
	100.02

The above specimens furnish the degrees of purity of the three principal forms in which these ores are found. They give no trace of sulphur, phosphorus, or other injurious substance—the insoluble residuum being almost pure silica.

Iron Manufactured from Ores of the Jackson Iron Mountain; quality, &c.—A small forge was constructed on the Carp River, within about three miles of the Jackson Iron Mountain, in 1847, and something over 1,000 tons of blooms have since been manufactured at that place. Some of the first iron made was sent to Washington and other places for trial. (See comparative test below.) The metal tested was wrought directly from the ore in the Catalan forge, after being burned and stamped, without washing or other preparation. The reduction was made with charcoal by the cold-blast process. In 1851 the hot-blast was introduced.

Several hundred tons of the Lake Superior blooms have been worked at the rolling mill of the exhibitors at Sharon, and placed upon the market. It has been fully tested for machinery purposes, boiler plate, railroad axles, wire, nails, fine tacks, &c., and stands unsurpassed by any iron in the world.

The following extract from the Report of Messrs. Foster and Whitney to Congress, published in 1851, will show its comparative strength with other iron from localities at home and in foreign countries:

	Strength in lbs. per sq. inch.
Iron from Salisbury, Connecticut	58.009
" Sweden	58.184
" Centre County, Pennsylvania	58.400
" Lancaster County, Pennsylvania	58.661
" McIntire, Essex County, New York	58.912
" England (Cable bolt, E. V.)	58.105
" Russia	76.069
" Jackson Iron Mountain, Michigan, as determined by Major Wade	89.582

Extent of the Jackson Iron Mountain; facilities for Commerce and Manufacture.—The Jackson Iron Mountain is a rugged hill about three-quarters of a mile long and half a mile wide from base to base, and varying from 50 feet in height on the north, to 200 feet on the more southern portion, at its highest points along the general level of the surrounding country. It is a vast ledge of iron ore, traversed in all directions by seams which divide the whole into masses from minute sizes to several thousand pounds weight. Elevated above the level of the surrounding country, therefore there are countless thousand tons of this ore. Its extent beneath, the labor of ages only can approach.

The vast and increasing consumption of iron in the North-West for railway and other purposes, and the superior quality of this iron, render its speedy development and general use a matter of high public concern.

Being located within twelve miles of the waters of the great chain of American Lakes, affording the cheapest inland navigation in the world, and furnishing a highway to the shores and cities of seven of the States of the Union, with exhaustless quantities of mineral coal and charcoal timber within their borders, affording, it is believed, unrivalled facilities for the successful manufacture of this iron.]

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39. THURBER, PHILIP, *Detroit, Michigan.*—Producer and Manufacturer.

Amorphous nickeliferous specular iron ore, and specimens of iron made from it, from Marquette, Michigan.

[Specular iron ore or sesqui-oxyd of iron, is a very abundant ore of that metal. In the United States, in consideration of the enormous masses of it found in Michigan and in Missouri, it may be said to be probably the most abundant of all our iron ores. It occurs in a variety of forms, sometimes, as on the island of Elba, in magnificent rhombohedrons, with faces which present a splendid metallic lustre (whence the name *specular iron ore*); sometimes in minute brilliant scales, like mica, then called *micaceous iron ore;* and sometimes in amorphous compact masses, as in the present case. This ore, like the other specular ores of the Lake Superior region, is entirely free from sulphur, phosphorus, manganese, &c. It contains, however, a considerable per centage of silica, arising from some silicate of iron which it contains in admixture. The peculiarity of this ore, however, which has not been observed in any other ore from that region, is that it contains a small per centage of nickel. This content of nickel is communicated to the iron exhibited, made by the Catalan process, and gives it remarkable properties. Thus it has a silvery white appearance, and takes and retains a high polish. At the same time it resembles in its high degree of softness and toughness the other varieties of Lake Superior iron. Iron alloyed with three per cent. of nickel was observed many years ago, by Faraday, to possess the same peculiarities above described. Nickeliferous iron ores are not very common, but among the North Carolina minerals, collected by Mr. Wm. P. Blake for exhibition in the Palace, may be observed a nickeliferous limonite from Lincoln County.]

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40. JACKSON, JOSEPH, *Rockaway, New Jersey.*—Producer.

Limonite iron ore, two varieties, from mines situated respectively two and three miles from Rockaway, New Jersey; limestone containing fossils (flux).

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41. SKEWS & VALLEE, *Missouri.*

Specimens of limonite iron ore and pig-iron; galenas with cerusite, from Cove Mines, Franklin County, Missouri.

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42. GRAND TOWER IRON WORKS, *Perry County, Missouri.* (President, S. F. NIDELET.)

Limonite iron ore, large mass weighing 1,500 lbs.; kaolin, bituminous coal, and fossils.

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43. ST. LOUIS AND BIRMINGHAM IRON MINING COMPANY, *St. Louis, Missouri.* (President, THOMAS E. COURTENAY.)

Ores from the property of the Company situated on the Mississippi River, in Perry County, 120 miles below St. Louis, Missouri, principally composed of limonite, with silicious ores and specimens of the gangue, which is a hard amorphous silicious rock; also specimens of baked fire clay.

Specimens of bituminous coal from the Coal Banks on Big Muddy River, in Jackson County, Illinois, opposite Birmingham, Missouri.

[Dr. Jackson has made an analysis of this iron ore which gave the following results:

Hygroscopic water	1.20 per cent.
Combined water	10.60 "
Silica	9.00 "
Oxyd of manganese	1.00 "
Alumina	1.00 "
Sesquioxyd of iron	77.30 "

This quantity of oxyd of iron corresponds to 53.59 per cent. of metallic iron. No traces of sulphur, phosphorus, or arsenic were found.

The mines from which these ores are sent are situated near the mouth of Apple Creek, a tributary of the Mississippi, in Perry County, Missouri, about 120 miles below St. Louis. The following facts are condensed principally from the report made to the Company by Mr. J. D. Whitney. The surface of the country, from a mile to a mile and a half directly west of the landing at the mouth of the creek, is a net-work of ridges running in every direction, and elevated about 150 feet above the valleys, the whole height above the Mississippi being from 200 to 250 feet. The principal ridge runs nearly east and west, but towards its western extremity bends to the north. On the summit and sides of the elevation is found an abundance of loose masses of limonite ore, and the solid ore is seen in two or three places where the surface soil has been removed. The deposit, as seen on the top of the hill, consists of limonite in bands or layers, alternating and interlacing with cherty or silicious limestone. Iron ore seems to be scattered with a liberal hand on the ridges in this neighborhood, but the most important locality at present known to exist upon the Company's lands, is that called "the iron ridge," about a mile west of the river. This ridge is elevated from 125 to 150 feet above the valley, and is made up entirely of more or less pure limonite, over an extent of several acres at least. The ridge runs nearly north and south. Its whole surface is covered with fragments or masses of ore. At the southern end it is composed of a breccia of limonite and silicious matter. The silica is in small angular fragments, which are cemented together by a paste composed of limonite. As we approach the centre of the hills going north, the masses of ore which cover it become apparently quite pure and free from foreign matter. In short, the whole ridge is made up of limonite, the portions along the centre, and for a perpendicular depth not yet ascertained, but certainly over 50 feet, being almost entirely free from foreign matter, and such as would yield at least 50 per cent. of metallic iron. The coal fields of Illinois are close at hand, and coal, specimens of which were shown, may be brought from the coal beds of the Big Muddy River to the furnace with but a few rods of land transportation. The quality of this coal, according to R. C. Taylor, in his great work on coal, "is most excellent, igniting readily, and caking together perfectly without making much clinker. It has been used for fifty years by the old French settlers to make edge-tools, which have borne a high reputation. The Muddy Creek coal seam is a horizontal bed 6 or 7 feet thick, above which is another vein not heretofore worked. Coal can be thrown from the mouth of the drift into a boat." Professor C. U. Shepard states that this coal is quite free from iron pyrites, and consequently well adapted for metallurgic uses, that its specific gravity is 1.31, that it contains 33.5 to 37.5 per cent. of volatile ingredients, giving 58 to 55 per cent. of coke and and 8.5 per cent. of ash.]

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44. ROGERS, ISAAC, *Richmond, Virginia.*

Botryoidal limonite, very curious forms; granular specular iron; magnetite containing mica; hearthstone, a green, fine-grained gneiss; bituminous coal.

45. Ellis, Dr. H., *Wardensville, Hardy County, Virginia.*

Specimens of limonite iron ore from Trout Run Bank, Hardy County; from Bradfield Bank, ditto, and from Red Bank, ditto.

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46. Mount Savage Iron Company, *Cumberland, Alleghany County, Maryland.*—Producers.

No. 1. Bituminous coal, Mount Savage Vein, 3 feet.
2. " Bruce Hill Vein, 6 feet.
3. Coke, burned in open air.
4. " " oven.
Fluxes 5. Compact limestone from Wills Creek.
6. Crystalline limestone from Wills Creek, below the coal measures.
7. Slaty limestone from Wills Creek, below the coal measures.
8. Limestone from Bruce Hill, above the coal.
9. Iron stone from Bruce Hill, of the coal formation.
10. Fossiliferous iron ore from Wills Creek.
11. Limonite ore from Clear Spring, Maryland.
12. " " South Branch.
12 B. Conglomerate (hearthstone)
13. Grey cinder from Blast Furnace.
14. Black cinder.
15. Grey iron.
16. Grey and white iron.
17. White iron.
18. White chilled iron.
19. Riddled bar.
20. Mill bar.
21. Cinder from puddling furnace.
22. " "
23. Compound rail (patent)
24. Hard fire-clay.
25. " " burned.
26. Soft fire-clay.
27. " " burned.
28. Mixture of hard and soft fire-clay for brick.
29. " " " " burned.
30. Fire-clay before burning.
Fire brick.

Clay-iron stones, called hone ore, chocolate ore, etc.; slags from smelting and puddling furnaces.

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47. Lemmon & Glenn.

Clay-iron stones from White Oak Bottom, Maryland, with specimens of slag.

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48. Morrell P., *Baltimore, Maryland.*—Producer.

Argillaceous iron ore, pig-iron, and cinder, from Cedar Point Furnace.

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49. Reese, D. M., *Laurel Foundry, Baltimore, Maryland.*—Manufacturer.

Iron ore and pig-iron for puddling, for car wheels, &c.

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50. Kerr, Patrick, *St. Charles Furnace, Clarion County, Pennsylvania.*—Manufacturer.

Two varieties of iron ore; iron for foundry and for forge purposes; limestone flux; cinder.

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51. Lackawanna Iron Company. Agent: J. J. Phelps, 45 *Wall Street, New York.*

Iron ores.

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52. Moore, J. M., *Alabama.*

Iron ores from Alabama.

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53. Nuchols, G. S., *Union, Missouri.*

Iron ores and pig metal.

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54. Quinnipiac Malleable Iron Company, *New Haven, Connecticut.*—Manufacturers. H. Bushnell, Agent

Specimens of pig-iron and castings made from it, afterwards rendered malleable by Boyden's process.

[Chemists have for many years used, for the purpose of obtaining iron free from carbon, a process, the invention of which is attributed to Boyden, which consists in heating together iron filings and the black oxyd of iron from the blacksmith's forge. The carbon and other foreign substances which may exist in the iron are thus burnt out by the oxygen of the forge-scales, and the iron left behind pure. Of course none of the iron itself can become oxydized, as would be the case if any other oxydizing agent were employed; because iron cannot decompose oxyd of iron, or rather, because oxygen cannot leave one portion of iron merely to combine with another. Thus only the foreign substances can by any possibility be oxydized. This ingenious idea was seen to have a practical bearing, and it was conceived, that not only filings, but larger pieces of iron, might be decarbonized in this way. Experiments were made, and, in short, the result has been the process, now well known to practical men in this country under the name of Boyden's process, for making cast iron malleable. Castings of small objects, such as keys, buckles, harness and carriage trimmings, are made in the most brittle and highly carbonized cast iron. These articles are then completely buried in pulverized forge-scales, packed in iron chests, and heated for some days in ovens of peculiar construction to a high red heat. The carbon of the cast iron combines with the oxygen from the scales to form carbonic acid gas, and this gas coming everywhere in contact with the highly-heated mass, combines with another equivalent of carbon to form oxyd of carbon. An escape pipe is left in the top of the oven, from which the oxyd of carbon is delivered, and being a combustible gas it is set on fire, and thus furnishes the workmen a safe and certain index of the progress and completion of the process; for when the iron is wholly decarbonized the pale blue flame of the oxyd of carbon ceases. The fires are then allowed to die away, the furnaces are closed and suffered to cool gradually. On opening the chests, the cast iron, before brittle as glass, is now found perfectly soft and malleable, and even capable of being welded. The operation of the puddling furnace has, in fact, been performed upon the iron without destroying its form. The surface of the articles when first seen is found to be most beautifully tarnished and crystalline. This process is necessarily restricted to thin and light articles.]

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55. Renton, James, *Newark, New Jersey.*—Inventor.

Models and samples illustrating a new apparatus and process for making malleable iron directly from the ore with one fire.

1. A specimen of the ore (magnetite).
2. " " crushed.
4. " of mixture of crushed ore and coal in the proportions used.
5. " of pulverulent metallic iron produced by the deoxydation.
6. A bloom of malleable iron made from the above ore by this process.
7. A variety of specimens of worked iron, bent and twisted to show its tenacity.
8. Specimens of slags formed in the balling furnaces.
9. A model of the furnace, with drawings.

[The economy of fuel in the manufacture of iron is one of the most important objects which can occupy the ingenuity and research of scientific and practical men. It is well known that the quantity of fuel consumed in making a given quantity of malleable iron, is a considerable multiple of that which would be necessary if a complete economy of the heat could be effected. Every one knows that there are two distinct varieties of iron in use all over the world, which go under the names of *pig* or *cast* iron, and *bar* or *malleable* iron, and most persons are aware also that bar iron is the purest form, and that cast iron owes its brittleness, fusibility, and crystalline structure to the presence of impurities, chiefly carbon, which must be extracted to convert it into malleable iron. Now, although a certain quantity of cast iron will always be required by the world, its fusibility being, for many uses, an indispensable property, yet the quantity used compared with that of malleable iron will always be comparatively very small, and, in fact, nearly the whole of the pig-iron is made for the express purpose of being subsequently converted into malleable iron. This is the almost universal modern practice of making malleable iron, to obtain from the ore, in the first place, an impure and carbonaceous iron by one process, and then to remove, as far as possible, these impurities by another process. In reality, great pains and expense are incurred in the first place, partially for the purpose of introducing into the iron an impurity (for the ore contains no carbon), for the sole purpose of removing which an additional amount of labor and expense is necessary. In this light, the present condition of the iron manufacture seems exceedingly primitive and unscientific. Roundabout as this way is, however, it is far preferable in point of economy to the older "bloomery" process. By this, malleable iron is obtained directly from the ore by one fire, which fire must be fed, however, by the most expensive kind of fuel, generally charcoal; and, owing to the very great quantity of fuel which, from the nature of the process, must necessarily be consumed without contributing to the effect, the process is even less economical than the other, and can only be used where charcoal is very cheap. Still, however, a very great proportion of our very best qualities of iron is made by this process, for example, the Russian iron; the iron from which the Hindoo prepares his celebrated "wootz," or Indian steel, and others. This superiority is due to the greater freedom from impurities of this iron, which is owing to the fact that it comes into contact, during its manufacture, with no other contaminating influence than that of the ash of charcoal, which is comparatively free from those substances which are most injurious to iron. The alkali contained in the charcoal has, undoubtedly, also an important effect, having the property of combining powerfully with all these contaminating substances, thus having a tendency to prevent their combination with the iron; thus it has been proposed recently to use, in the ordinary manufacture of iron, substances containing alkalies, such as wood ashes, soda ash, or even common salt, and the latter substance is said to have been used in England, where it is exceedingly cheap, with marked advantage. It is evident, however, that in this case prevention is better than cure, and that the submission of the iron, during its manufacture, to as few deteriorating influences as possible, is far preferable to the adoption of any necessarily imperfect means of obviating these influences. Thus the process which combines the greatest economy of fuel with the least possible contact of the iron during its formation with the fuel itself, will ultimately supersede all others. Now, in any process of obtaining soft iron directly from its ores, there must necessarily be two distinct stages. All iron ores consist essentially of iron and oxygen, and the first stage of the process must consist in the removal of the oxygen, so as to reduce the iron to the metallic form, and the second, in the agglutination or aggregation of this iron into a dense homogeneous mass, free from all visible pores. Now a fact has been long known to chemists which has a bearing upon the first stage of this process in the highest degree important. This is, that the oxyds of iron of which iron ores are composed, do not require for their oxydation or reduction to the metallic form, the intense heat of a blast-furnace; but by the proper deoxydizing agents they may be brought readily into the metallic form by a comparatively low heat. Thus to obtain pure metallic iron for the use of physicians, or the *pulvis ferri* of the pharmacopeias, the practice has been for many years to submit prepared oxyd of iron heated in a tube to the action of a current of hydrogen gas, which abstracts its oxygen, forming water. This has undoubtedly suggested the recent improvements which have been introduced into the iron manufacture. It is of course, however, impossible to employ, in operations on a manufacturing scale, so expensive a gas as hydrogen, and recourse is therefore had to the far cheaper gas called carbonic oxyd. The general scheme of all the processes which have been recently proposed for obtaining soft iron directly from the ore, is to crush the ore to a coarse powder, mix it with some carbonaceous matter, also in powder, and heat the mixture in a closed vessel to a red heat until the oxygen of the ore has passed off, together with the carbon, in the form of carbonic acid gas, upon which the metallic iron powder is transferred to a reverberatory furnace, where it is caused, by an intense heat, just as in an ordinary puddling furnace, to agglutinate together into a mass, which the workman, with his tool, can

work up into balls, and put under the trip-hammer. The first person who succeeded in accomplishing this practically was an English inventor by the name of Clay, who heated his mixture of iron and carbon in a gas retort, and after deoxydation transferred it to the hearth of a reverberatory furnace. His patent dates about the year 1840. The process immediately under consideration is an important modification of this. Its peculiarities consist in the heating of the mixture of ore and carbon in *upright flat tubes*, which are heated *by the waste heat* of the reverberatory furnace, this heat being found amply sufficient to accomplish the deoxydation of as much ore as can be balled in a given time. The quantity of carbon, in the form of anthracite, mixed with the ore, is only from 15 to 20 per cent. of the ore. Pure magnetite ore requires for complete deoxydation less than 11 per cent. of pure carbon; but on account of impurities in the coal, and the necessity of using an excess, a greater proportion is found desirable. The time required for the deoxydation depends upon the fineness to which the materials are pulverized; but even lumps of ore of the size of a walnut will be found in the course of a few hours completely converted into iron, the metallic lustre of which is easily developed by slight burnishing. The process which goes on in the interior of the tubes during the deoxydation is undoubtedly as follows: By the combination of the carbon with the oxygen of the ore, wherever the particles of the two are immediately in contact, a portion of *carbonic oxyd* gas is formed, which pervades the whole mass, and on account of the porosity of the ore can penetrate by diffusion into the centre of masses even of considerable size, and having the power of combining with twice the quantity of oxygen which it already contains, to form *carbonic acid* gas, gradually combines with and removes the oxygen from every part of the mass. So that this process is precisely the reverse of Boyden's process of converting cast into malleable iron, as already described. In this process the object is to remove oxygen, and the affinity of carbonic oxyd for oxygen is taken advantage of; while in Boyden's process the object is to remove carbon, and the power used is the affinity of carbonic acid for carbon.

The time and amount of fuel required to make one ton of malleable iron from the ore by this process are about the same as those required to make a ton of malleable iron from pig in a puddling furnace, thus, as it would seem, saving the whole expense and time required to smelt the ore in a smelting furnace, and accomplishing the same effect within the same time by the use of but one fire, which has been heretofore accomplished with two. But economy of fuel is not the only advantage claimed for this process. The other grand desideratum mentioned above appears to be, to some extent, accomplished, namely, a very much less degree of contact of the iron, during its formation, with the fuel and its contaminating ingredients. Two furnaces on this plan have been erected at Newark, New Jersey, and have been in operation for more than a year. The ore is first crushed by stampers, mixed with 15 or 20 per cent. of pulverized Hazelton, or other superior variety of anthracite coal, which is found preferable even to charcoal for the deoxydation. The mixture is raised by an elevator to the tops of the tubes, which are filled, loosely covered over, and exposed to the waste heat for some hours. The deoxydized iron is then, by the opening of a valve, allowed to fall from the tube and slide down a short inclined plane immediately to the hearth of the reverberatory, where it is balled. During the balling, the silica contained in the ore and in the ashes of the fuel melts down with a portion of the oxyd of iron not deoxydized, together with the other impurities present, into a slag, which, from time to time, is drawn through an aperture at the side. A specimen of this slag gave upon analysis 60 per cent. of iron and about 12 per cent. of silica. The loss, however, of iron in the form of slag, owing to the small quantity of this slag, is not greater than in the usual operation of smelting with a flux, and when a sufficient quantity of this richly ferriferous slag has accumulated, it may be smelted in a blast-furnace like any other ore of iron, and converted into pig. These two furnaces make each two tons of blooms in twenty-four hours, which is about the capacity of an ordinary puddling furnace. The cost of making these blooms at Newark, according to the estimate of the Company who have erected the two furnaces spoken of, is less than $30 per ton. One fact must not be passed over without mention, which is, that silicious ores cannot be worked to any advantage by this process, for carbonic oxyd gas has not the power of decomposing silicate of iron, and in working such ores it is always necessary to add lime for the purpose of decomposing the silicate of iron before a deoxydizing agent will act. No ores are therefore adapted for this process but magnetites, hematites, including limonite and specular iron, spathic iron ores, and clay ironstones nearly free from silica.

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56. Orville Dakin, *North-East, Duchess County, New York.*

Limonite from the North-East Ore-bed; specimens of pig-iron made from the ore in a blast-furnace of the common size, with charcoal and a cold-blast, five tons of iron being produced in twenty-four hours; specimens of slags and hearthstones.

[The term limonite embraces several varieties of the hydrous per-oxyd of iron, viz., brown hematite, brown iron stone, brown ocher, bog ore, etc. *Red Hematite* is a variety of specular iron. Limonite contains per-oxyd of iron 85.58, water 14 : 42=100. It is rarely quite pure, however, and usually contains a small portion of silica. The bog-iron ore is often mixed with phosphoric acid (sometimes 10 or 11 per cent.), and also with some salts of organic acids formed in marshy grounds. Limonite often occurs in stalactitilical forms, with a silky and submetallic lustre, as well as massive and earthy. The most important deposits of brown hematite belong to the Tertiary formation, although brown ore often results from the decomposition of other ores (and particularly of iron pyrites), and is therefore found in crystalline and secondary rocks, in beds and veins, associated at times with spathic iron, heavy spar, calcareous spar, arragonite, and quartz; and it is often associated also with ores of manganese. Limonite is one of the most important ores of iron, and has a wide range in the United States. Some of our best iron (*e. g.*, the Cornwall and Salisbury iron) is made from it by charcoal. The bog ore, owing to the phosphorus it contains, usually makes a *cold short* iron far less valuable. For further information on this subject refer to No. 58.]

57. The Association for the Exhibition of the Industry of all Nations.—Proprietors.

Collected by Ludwig Stadtmueller, New Haven, Connecticut.

a. From Canfield, Robbins & Co., Falls Village, Connecticut:

Iron ore from Salisbury Mines (mammillary limonite); calcined ore; fluxes; mixture of ore with fluxes; different qualities of pig-iron; cinder; forged iron; puddled iron; gun iron for United States navy, made with a cold-blast in a charcoal furnace.

b. From H. Sage, Lakeville, Connecticut:

Iron ore of various qualities, washed and unwashed; limonite ore, from Lakeville.

c. From the Cornwall Iron Company, West Cornwall, Connecticut:

Samples of Salisbury limonite, crude, calcined, and washed; flux; mixture of ore and flux; varieties of pig-iron; varieties of slags; hearthstone. The iron is made in a charcoal furnace with a cold-blast, and five tons of pig are made every twenty-four hours.

d. From Richardson, Barnum & Co., Salisbury, Connecticut:

Specimens of mammillary specular iron and limonite ores from Salisbury; flux; various qualities of pig-iron; cinders; hearthstones; stalactites.

[Salisbury, in Litchfield County, Connecticut, is the location of some of the earliest iron mines worked in the United States. About the year 1731 the ore was first mined to any extent, and was used at the iron works of General Henry Livingston, at Ancram, New York. About 1762 a blast-furnace was erected in Salisbury, at which cannon, shot, and shells were made for the United States Government during the Revolutionary War. "Old Ironsides" was armed with cannon made at this furnace. Since 1784 a record has been kept of the quantity of ore taken out: from 1784 to 1800 this quantity ranged from 900 to 1,500 tons annually; from 1800 to 1815, 2,000 to 3,000 tons annually; 1815 to 1830, about 3,000 to 4,000 tons; 1830 to 1840, about 5,000. In the year 1838, however, another ore-bed was opened, and about seven years ago still another, and the annual average now mined at Salisbury is about 20,000 tons. The ore is principally limonite, although specimens of specular iron are also found. The three several ore-beds now opened are described as being composed of veins, or, rather, ridges of ore, running in every direction, and disconnected bodies of the ore, from 500 to 2,000 tons weight, are frequently found imbedded in clay. The oldest ore-bed has been opened in a north and south direction to a distance of 100 rods, and in an east and west direction about 45 rods, and is bounded on the east and west sides by walls of mica-slate. Mica-slate is never found anywhere between these walls, but the ridges of ore which do not reach these walls generally terminate in clay. On the western side the ore lies very near the surface, and slopes downward in an easterly direction, striking the eastern wall of mica-slate sometimes at a depth of 75 feet. The north and south range of this bed is supposed to be much greater than has yet been explored, and the quantity of ore yet unmined is sufficient to supply the present demand for an indefinite time. In one of the newer ore-beds the ore lies within four feet of the surface, and was accidentally discovered about one hundred years since by the uprooting of a tree. It is mined to a depth of 40 feet. The bed, as far as opened, has an extent of about twenty acres, and is apparently bounded, not only on the east and west, but on the north side also, by walls or barriers of *limestone*, none of the material forming the walls, as in the former case, being found in the bed itself. The third bed, most recently discovered, lies but half a mile south of the old ore-bed, and being precisely similar to the latter in character, and yielding iron of the same quality is supposed to be the continuation of the same deposit. The quality of the ore from the second bed differs somewhat from that of the first and third, being smelted at a lower temperature, and producing a softer, denser, and more compact iron; but opinions differ with regard to the relative strength of the two varieties of iron, and it is thought by some that a mixture, in equal proportions, of the two ores, makes an iron superior to either worked separately.]

e. Spathic iron from the great vein on *Mine Hill*, in Roxbury, Connecticut:

[This vein of spathic iron is undoubtedly one of the most remarkable mineral veins in North America, and deserves a more extended notice. "Mine Hill" is situated about three miles southeast from the village of New Milford, and close by the Shepaug River. It is a portion of a moderately high range of light-colored gneiss (γ of Dr. Percival's map of Connecticut, in the formation G, western Primary), easily split into long flagstones. The beds of gneiss preserve a uniform southwest and northeast direction, and dip at an angle of 30° toward the northwest. Not far from the summit of the hill (which is covered with soil and well timbered), and on its northeast slope, a shaft has been sunk on a vein of spathic iron running northwest and southeast, and crossing the strata of the gneiss nearly at a right angle. At the surface this vein is about three feet wide, but it increases very much as it goes down deeper. The vein stone is crystallized quartz, in which the spathic iron is so abundantly diffused, as to form the larger part of the mass. Some zinc blende, and occasionally a little galena (argentiferous), has been observed. The working of this vein for the sake of its argentiferous galena is a tradition of the country, and it seems certain, from the abundance of the sparry iron now visible in the ore heaps, that the object of the exploration was not the iron. The vein is distinctly traceable in the northwest a distance of at least two miles, pursuing a remarkable regularity of course and width, still presenting essentially the same character. The amount of ore above water-level in this mountain is very large. It is in the midst of a well-wooded region, where charcoal is cheap, and considering the ease with which iron and coarse steel are made directly from the sparry iron, it is not easy to explain the lethargy which suffers so valuable a property to slumber.

It is very possible that in depth this vein may carry copper pyrites as well as galena. An adit driven in the course of the vein at the foot of the hill would soon expose its hidden resources, and lay open a vast store of mineral. Several attempts have been made to work this vein for silver, but it is certain that its true value is its peculiar and rich

iron ore. It is from this ore in Austria (in Tyrol, Carinthia, and Styria) that the well-known German steel is made.

Spathic or sparry iron is composed of carbonic acid 37.94 and protoxyd of iron 62.06, with usually a trace of manganese, lime, and magnesia. Its color at Roxbury is a very light yellow when first opened, but on exposure it becomes rust-colored.]

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58. Brandon Iron and Car Wheel Company, *Brandon, Rutland County, Vermont.* Treasurer, James Adams, 66 *State Street, Boston.*—Manufacturers.

A map of Brandon, and plans of the ore-beds belonging to the Company.

Specimens of wall rock (granular limestone); various specimens of the ore, consisting of limonite, more or less pure; roasted limonite; pig-iron; slags; clay; fire-brick; slate; fine white marble; lignite.

[The specimens exhibited from this locality are examples of a group of iron ores known as limonite or brown hematitic ores, which have a wide geographical extent in the United States, and belong to a single geological epoch. There are other hematitic ores resembling these and of different geological age, but we propose, for the sake of convenience, to group together those which are known to be of one geological age or to belong to the same formation.

The iron ores of Brandon, Bennington, and those of other towns in Vermont not represented in the Exhibition; those of Stockbridge and Richmond, Massachusetts; of Salisbury, Connecticut, exhibited by several parties, No. 57, *a b c d;* those from North-East, New York, No. 56, and from numerous localities in Pennsylvania and Maryland, belong to a Tertiary formation which extends from the northern limits of the United States to Alabama. This formation lies near the western base of the Green Mountains throughout Vermont, Massachusetts, a part of New York and Connecticut. The formation is less conspicuous in New Jersey, but becomes of great importance in Pennsylvania, following the range of the lower Silurian limestone at the eastern base of the Alleghany Mountains, and extending in the same direction into Maryland and Virginia.

This ore in New England is associated with manganese ores, with a variety of fine and coarse clays or porcelain earth, with coarse quartz ore gravel; and at Brandon, Vermont, with a bed of lignite, containing fossil wood, leaves, and fruits. This is the only known locality where there occurs such a bed of lignite or fossil fruits; though the same clays and other associations are known in numerous localities. The fruits are all of extinct species, and offer for the first time means of comparison with other deposits containing remains of land plants and fruits.

The fossil fruits, though not specifically identical, are very similar, and closely allied to the fossil fruits of the brown coal of Europe, and leave no doubt of the identity in age, or that plants of the same general character existed on this continent at the time of the deposition of these hematites and clays which are associated with the lignite.

The clays are variegated, and are seen in beds of pure white, various shades of yellow and brown, colored from iron, and of pink and purple, colored from manganese.

The iron ore of this formation produces some of the best iron in the country, and its economical importance is immense. It was from this formation that some of the earliest-established furnaces in the United States obtained their ore. The Salisbury iron ore, long famous for the fine quality of iron which it produces, is one of the longest wrought; and now furnishes specimens from at least four different manufactories, with samples of their productions. The mines at West Stockbridge and Richmond, Massachusetts, have been worked for more than half a century, and now furnish large quantities of this ore, not only for the furnaces in the neighborhood, but also afford the chief supply for two extensive furnaces on the Hudson River, at the city of Hudson. Bennington, Vermont, has long been known for its manufactory of iron from the hematite of the same formation. At Brandon, Vermont, the ore is extracted in large quantities and converted into various forms of manufactured iron. The ores from the same formation in Pennsylvania are extensively used, and, indeed, are regarded as among the most valuable ores of that State so rich in iron.

In nearly all the localities in New England where this ore has been wrought, it has been sought only in chance-discovered isolated localities. Until recently it has not been recognized as a part of a well-characterized and continuous formation. The acquisition of this knowledge gives additional confidence in its permanence, and it is probable that it may be successfully sought in an almost continuous line along the eastern slope of the Green Mountains, where so many separate and distinct localities are already known. The knowledge of this fact is of great importance to the community, and particularly to those directly interested in the manufacture of iron. The proximity of this valuable belt of iron ore to the navigable waters of the Hudson and Lake Champlain, suggests the probability of its extensive use in manufactures that shall be established along these lines of communication. The two furnaces now established at Hudson are but the commencement for innumerable similar establishments, when the coal from Pennsylvania shall meet the hematites of the Green Mountains and the magnetic ores of the Adirondack, both equally accessible. With the exception of the two furnaces at Hudson, iron has been made throughout New England by charcoal alone, and no iron manufactured in the country has a better reputation than this. J. H.]

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59. Association for the Exhibition of the Industry of all Nations. Collected by Dr. F. A. Gerith, of *Philadelphia.*

From the Bichromate of Potash Works of Jesse Tyson, Baltimore, Maryland:

1. Chromic iron from Wood's pits, Lancaster County, Pennsylvania.
2. Ditto with Kammererite (pyrosclerite) and "nickel gymnite."
3. Ditto from Soldier's Delight, Anne Arundel County, Maryland.
4. Sandy chrome ore from Delaware County, Pennsylvania.
5. Ditto from Chester County, Pennsylvania.
6. Gangue from Wood's pits.
7. Specimens illustrating the manufacture of bichromate of potash, and samples of the product.

[Chromic iron is a very important mineral, and occurs in considerable abundance in the United States and in Canada. It is composed (that from Baltimore) of protoxyd of iron 36, sesqui-oxyd of chromium 39.51, alumina 13, silica 10; but its composition is not always the same. Its use in the arts is in the manufacture of chromate and bichromate of potash, salts largely used in dyeing and other arts; and also in producing the important pigments, *chrome yellow, chrome green,* and *chrome red,* usually called American vermillion. *Zinc yellow* is also another color formed from it, less brilliant than chrome yellow (chromate of lead), but cheaper and more enduring. Chromic iron has a fixed geological position, and is almost invariably associated with the serpentines of the newer metamorphic rocks. In this position it occurs from the northern part of Vermont to Virginia; but is sufficiently abundant for economical purposes only in the serpentines of Maryland (Baltimore Bare Hills, etc.), and those of Chester and Lancaster counties in Pennsylvania, so far as yet observed. It gives its gay and lizard-like markings to the serpentines in which it occurs. The chromic iron and the serpentines of Pennsylvania have associated with them a small portion of nickel, existing in the chromic iron as sulphuret of nickel, and by atmospheric agencies converted into a brilliant emerald-green coating, which lines narrow fissures in the chromic iron. The analysis of the serpentine, and other associated minerals from Lancaster County, shows always the presence of nickel, sometimes to the extent of one or two per cent. The largest deposit of this mineral in the Old World is that lately discovered by Dr. J. L. Smith in Asia Minor. Chromium was first recognized as a distinct mineral by Vaquelin in 1797, and was so named in allusion to the brilliant colors which it produces.]

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60. James D. Curtis, 51 *Liberty Street, New York.*—Proprietor.

Franklinite from the mines of the New Jersey Zinc Company, Sussex County, New Jersey.

[This was a mass of many hundred pounds weight, placed among other large specimens in the yard. *Franklinite* is an ore of iron, zinc, and manganese. Its composition in 100 parts is, according to Berthier, sesqui-oxyd of iron 66, per-oxyd of manganese 16, and oxyd of zinc 17. It abounds in New Jersey, both at Hamburgh, near the Franklin Furnace (whence its name), and also in a still more remarkable deposit at Stirling, associated with willemite (silicate of zinc) in a large vein, in which cavities sometimes contain crystals from one to four inches in diameter. It crystallizes in regular octahedrons. By exposure to heat in the subliming furnace the oxyd of zinc is driven off from this ore, and attempts have been made to employ the residue as an iron ore. Indeed, specimens of iron made from it were exhibited by the New Jersey Zinc Company, which had apparently excellent properties. Franklinite is an ore not found in any other known locality besides those named above, except at Altenberg, near Aix la Chapelle, in France.]

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3. *Ores of the Common Metals.*

61. Lane, A. A., *New York City.*—Producer.

Black manganese ore (psilomelane), from Edgefield District, South Carolina, from a deposit estimated to contain at least 40,000 tons above the water level. Analysis indicates 76 per cent. of deutoxyd of manganese.

[These specimens of manganese are remarkable for their size (weighing some hundreds of pounds) and purity. The mineral is compact and crystalline, and would require crushing before it would be in a marketable condition. Those specimens sent to the Exhibition were entirely free from adhering gangue stone.

The chief ores of manganese are *pyrolusite* and *psilomelane** (the present ore), composed of mixed protoxyd and peroxyd of manganese and water; *manganite* (gray oxyd of manganese), which is a hydrous peroxyd; and *wad,* which is an earthy, soft, and often impure psilomelane, bearing the same relation to the latter that bog iron ore does to limonite.

The *silicate of manganese,* or manganese spar, is hardly an ore of economical importance, although of frequent occurrence. It is a flesh or pinkish colored mineral, found at Cummington and Plainfield, in Massachusetts; at Hinsdale and Winchester, New Hampshire; and is stated to be very abundant at Blue Hill Mountain, in Maine.

The other ores of manganese are widely diffused throughout the United States, and usually in the same geological relations with the limonites as already described (§ 13). It occurs also in small quantities in nearly all argillaceous and arenaceous beds, in every geological epoch, owing its presence to the infiltration of its soluble salts, derived from solution of the ores already named, under atmospheric and other causes. The most valuable deposit in New England is that of Brandon, in Vermont, where pyrolusite, psilomelane, and wad, are the ores of greatest abundance. Manganese ore was shown from Brandon and Benington, Vermont, and from the present locality.

Pyrolusite and psilomelane (frequently confounded under the common term, *black manganese ore*) are valued in the arts as the most cheap and efficient oxydizing agents which we possess. When heated to near redness, they part with one equivalent, or proportion, of their combined oxygen; hence their use in the art of glass-making (see "Illustrated Record;" article, Glass). Indirectly, they serve an invaluable purpose, in furnishing the means of setting at liberty the chlorine of common salt; and, consequently, they become of indispensable importance in the manufacture of "bleaching powders" (chloride and hypochlorite of lime), and other bleaching or disinfecting substances, in which chlorine is either directly or indirectly the efficient agent; as, for example, in bleaching paper stock, where the chlorine gas is used directly, or in bleaching wax and oils, where the deoxydizing power of the permanganate of soda or potassa is resorted to. All the cotton and linen bleacheries now depend entirely upon chlorine or "bleaching powders," as the means of discharging color. Hence, it will readily be seen that an abundant supply of good peroxyd of manganese is a matter of

* Psilomelane is derived from two Greek words, signifying *smooth-black.* Pyrolusite is so named in allusion to its power of discharging the green and brown colors of glass, when in fusion (Greek πυς, *fire,* λυω, *to wash*). For the same reason, the French call it *glass-makers' soap.*

great industrial importance. It will be understood by the unscientific reader that the value of oxyd of manganese as a bleaching agent is only indirectly, as a means of furnishing oxygen. The ordinary mixture for chlorine, in the arts, is salt, peroxyd of manganese, and sulphuric acid, in proper equivalent proportions. The acid decomposes the manganese, forming sulphate of manganese, and setting at liberty an equivalent of oxygen; at the same time, the common salt is decomposed by the sulphuric acid, forming sulphate of soda and hydrochloric acid. But, as these actions are simultaneous, it happens that the oxygen from the manganese seizes the hydrogen of the hydrochloric acid and forms water, while the chlorine of that acid is set at liberty. Hence, the chemist, in his laboratory, places the hydrochloric acid directly in contact with the manganese to liberate chlorine, without going through the circuitous, but more economical process of the arts, in producing his hydrochloric acid as it is used, from the action of oil of vitriol or salt, as just described. This wonderful power of chlorine, to act as a bleaching and disinfecting agent, was accidentally discovered by Scheele, a Swedish chemist, in 1774, while he was experimenting upon the action of "spirit of-salt" (hydrochloric acid) upon various earthy and metallic oxyds, among which he used peroxyd of manganese.

Manganese is as widely distributed in the vegetable and animal world as iron. It is found in nearly all waters, in which its presence is made sensible by the very delicate test of Cowen, of Glasgow. Its soluble salts (sulphate, acetate, chloride, &c.) have lately acquired some reputation for therapeutic agents.

The manganese minerals were first distinguished from iron ores, by Pott, in 1740, subsequently investigated by Kaim and Winterl in 1770, and by Scheele and Bergman in 1774; but the peculiar metal contained in them was first discovered by Gahn, the master of the illustrious Berzelius.]

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62. The New Jersey Zinc Company, *Newark, New Jersey.*—Manufacturers. (Office, 45 *Dey Street, New York.*)

Red zinc ore, from Sterling, New Jersey.
Red zinc ore, with franklinite, from New Jersey.
White oxyd of zinc, dry and ground in oil.
Brown zinc paint.
Metallic zinc, in the form of thin foil, very white.
Pig iron, made from franklinite, very brilliant and crystalline, in large crystals, resembling those of metallic antimony.

[The red oxyd of zinc, which is an exceedingly valuable ore, and peculiar to the United States, occurs in large quantities, associated with franklinite, in Sussex county, New Jersey, where it is largely mined for the manufacture of white oxyd of zinc, for paint, at Newark, New Jersey. The ore is also ground in its natural state (both the red oxyd and the franklinite), producing a brown paint of considerable value.

The earliest scientific notice of the red zinc of New Jersey, is that of Dr. Archibald Bruce, in 1810, published in his "American Mineralogical Journal," page 96. He analyzed it, and found it to be composed of zinc, 76; oxygen, 16; oxyd of iron and manganese, 8. It was subsequently analyzed by Berthier (Ann. de Mines, iv. 483), who expressed the opinion that its red color was due to manganese. Mr. A. A. Hayes and Mr. J. D. Whitney have since examined it with great care. A valuable paper on this vein will be found in the "American Journal of Science," vol. xlviii. [1] page 259, by Francis Alger, Esq. This remarkable deposit appears to have attracted attention very early in the settlement of the country, but there is no evidence that Lord Stirling, who owned the property, or any one else, at that time, suspected the real nature of the metal. It is stated that large quantities of this ore (red oxyd of zinc) were shipped to England, under the impression that it was red oxyd of copper, and efforts were made to smelt it for that purpose. The first economical use made of this ore appears to have been by the late Mr. Hassler, Superintendent of the Coast Survey of the United States, and of the Weights and Measures; who employed it to make the brass used in the construction of the standard weights and measures.

The zinc deposits of New Jersey occupy a range of about four miles, north and south, along the valley of the Wallkill, in Sussex county, and in the township of Franklin. A range of granitic or gneissic rocks forms the eastern boundary of the valley, while, southerly, a less elevated range of granular limestone commences near Sparta, and extends through Stirling to Franklin. This range, which runs also nearly north and south, is the great repository of the mineral wealth of Sussex county. It abounds in forests and fine water-power, so important for the economical working of the ample stores of iron, and other metals held in its hills. The zinc beds are not found north of Franklin, nor south of Stirling. The great diluvial current has transported and scattered numerous fragments of the characteristic ores of this region in a southerly direction from their points of origin. The geology of this interesting region is ably discussed by Professor Henry D. Rogers, in his "Report on the Geology of New Jersey." He regards this limestone as a metamorphic member of the lower secondary, or Apalachian Rocks; an opinion sustained by characteristic fossils found in it, in one or two places. The beds, or deposits of zinc ore and franklinite, are conformable to the limestone beds, and do not cut them in the manner of true veins. The whole mass of limestone (and the gneiss, which is also, in the main, conformable) is uptilted at an angle of 70° to 80° east from the vertical. Their strike is nearly north-west and south-east. A vertical section of this group of deposits shows, first, the contact of the limestone on the east; then, an outer belt, of from three to seven feet in thickness, consisting of nearly equal parts in bulk of red oxyd of zinc and franklinite; next, a thin seam of black ferruginous limestone, from two to six inches thick, serving as a wall of separation between the zinc bedding, or portion of the vein above, and the heavy mass of pure franklinite beneath, which is often not less than twenty feet thick, and in some places is much thicker. These beds appear at several distinct places on the same line, but on two different hills (Stirling Hill and Mine Hill), and have been thus estimated, from actual measurement, as containing above water level the following quantities of franklinite and of red zinc, viz.:—

Franklinite on Stirling Hill.

Breadth, 36 feet; length, 528 feet; height, 200 feet.
Contents, 3,801,600 feet cube = 543,085 tons.

Franklinite on Mine Hill.

Breadth, 34 feet; length, 732 feet; height, 180 feet.
Contents..... 572,383 "

1,115,468 "

Red Zinc on Stirling Hill.

Vein (1)* 528 feet long × 200 feet wide × 5 feet wide.
Contents..... 120,000 "

Vein (2)* estimated as being 1,500 feet long × 140 feet high × 39 feet wide.
Contents..... 353,857 "

Total..... 1,188,572 "

No account is taken of the beds below water level. Dr. Jackson presents two new analyses of the franklinite, by Mr. G. I. Dickinson, his assistant:—

	No. 1.	No. 2.
Silica	0·290	0·127
Ox. iron ($Fe_2 O_3$)	66·072	66·115
Ox. zinc (Zn O)	21·395	21·771
Ox. manganese ($Mn_2 O_3$)	12·243	11·987
	100·000	100·000

Some notice has already been taken of the value of franklinite, as an ore of iron (No. 00). Large expectations are based, by the proprietors, upon the value of this ore for the purposes of making steel; and specimens of this, with very brilliant crystalline pig, made from the franklinite, were exhibited.

The New Jersey Zinc Company have hitherto devoted their attention, and with much evident success, to the production of *zinc white*, or oxyd of zinc, as a substitute for *white lead*. The whole product of their mines is at present converted into this pigment, except a small portion of the crude ore, ground up for a colored pigment.

The process employed at the Company's works in Newark, New Jersey, is sufficiently simple to be understood by a few words of explanation. The red zinc and franklinite, crushed to a coarse powder, are mingled with a small per cent. of anthracite dust, and heated in low, arched, sublimation ovens, so constructed as to admit the circulation of the fire above, as well as below. When the heat is sufficient, the oxyd of zinc rises by sublimation, and is conveyed into a trunk of sheet iron, through which a current of air is propelled by a fanning-wheel. The product of oxyd of zinc is thus drawn on through the trunk, and falls into bins or canvas sacks provided to catch it. The residuum, in the retorts or ovens, consists of the iron partly reduced, mingled with the excess of coal, and in a fit state for the high furnace. The total product of the several grades (1, 2, and 3) of white oxyd made in 1852 at these works, was 2,425,506 pounds; and in 1853 this product was increased about 70 per cent., being 4,043,415 pounds, of which 3,832,036 pounds was of No. 1, or the best quality. The product for November, 1853, the first month of the efficient operation of certain new machinery, was nearly 700,000 pounds; and it is expected that the product of zinc oxyd for 1854 will reach very nearly 8,000,000 pounds. The entire safety of this manufacture, as regards the health of those employed, alike in producing and consuming it, should alone suffice as a sufficient reason why zinc white should be universally substituted for lead. It is, however, preferable to lead as a permanent color, because it does not change under the influence of sulphurstted hydrogen, as in privies, aboard ships, and indeed, to some extent, every where; because the sulphuret of zinc is colorless, that of lead being black. Experience has shown that it is somewhat more difficult to lay on zinc white than lead, but the difference in labor is more than met by the difference in density, which is such that *four* parts of zinc white will cover the same surface which requires *seven* of white lead, as indicated by the experiments of Mr. Bunker, a practical painter in New York. Mr. J. Jarvis, of the United States Navy Yard at Brooklyn, states, as the result of a series of experiments on yellow pine wood, painted with various pigments and coal-tar, and sunk for more than four months in salt water, that those prepared with two coats of white zinc were entirely preserved from the attacks of "*teredo navalis*," and from the adhesion of barnacles, and other shell-fish; while the trial-pieces painted with white lead, "marine paint," verdigris, and coal-tar, were entirely incrusted with barnacles. The colored zinc-paints afforded much more protection against the barnacle than the common lead and other pigments, but less than the white zinc. It is probable that the emetic properties of the zinc salts, which must be produced in small quantities, from the action of the sea water, are sufficient to prevent the animals from obtaining a foothold upon the zinc surfaces.

The ores of zinc are usually very constant associates of those of lead, and the sulphuret of zinc is found in greater or less quantity in nearly every lead mine. The geological associations, therefore, are the same in both. The sulphuret of zinc is the most widely diffused of any of the ores of zinc, but thus far it has not been economically wrought in the United States. This ore occurs in considerable quantities in

* One-third the contents of which was estimated as zinc.

Maine, New Hampshire, Vermont, Massachusetts, and Connecticut; in the States of New York, Pennsylvania, Tennessee, and in large quantities in the lead regions of Missouri and the Northwest.

Calamine, or carbonate and silicate of zinc, occurs with the sulphurets of lead, in Missouri, Illinois, Wisconsin, Tennessee, Arkansas, and Pennsylvania, in valuable quantities, and in large quantities in numerous other localities.

The numerous localities of calamine in various parts of the United States were unrepresented by any special collections. Isolated specimens, from Pennsylvania (electric calamine), were found in the collections, of much scientific interest. It is stated, on the authority of Dr. D. D. Owen, that vast stores of this metal accompany the lead ores of Wisconsin, Iowa, and Missouri, and have thus far been regarded by the miners as refuse.]

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63. Blake, William P., *New York City.*—Observer.

Artificial crystallized oxyd of zinc, from the ore heaps and furnaces of the New Jersey Zinc Company.

[The blocks of red zinc, after being roasted, preparatory to the furnace process, are frequently coated with patches of delicate white acicular crystals of oxyd of zinc; and the same are formed in longer, and more perfect crystals, when the red zinc is heated with reducing agents in a lated crucible. Masses and incrustations of crystalline oxyd have been taken from the cavities of the large furnaces used to produce the zinc white. These artificial products are very beautiful, occurring in broad mammillary masses, of a delicate greenish-amber color, as delicate acicular crystals, beautifully arborescent, more frequently in globular masses and coatings, with botryoidal surfaces, which are drusy or covered with imperfectly formed crystals. Some specimens present the appearance of fusion, being adapted, as by flowing, to the crevices of the furnace. Beautiful tubes have been found of compact vitreous oxyd, two inches in diameter, and four to eight inches in length, the inside being studded with small crystals. The stalactitic masses were formed by the percolation of the fused ore through fissures in the floor of the oven, in which the charge of coal-dust and ore was spread. Whether the oxyd of zinc was in reality fused, itself, or only exhaled in vapor from the fused ferruginous mass of clay accompanying it, does not appear clear. Mr. Blake thinks that the crystals were formed by sublimation, and not by fusion of the zinc oxyd. The suite of specimens illustrating these facts was very beautiful and instructive.

In this connection, we call to mind the incrustations so often observed in the throats and funnels of the high furnace (and of which abundant examples were exhibited), to say that, contrary to the generally received opinion, these crusts are not carbonate of zinc or calamine, but are the oxyd of zinc, similar in appearance and origin to the subject of this note.]

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64. Wurtz, Henry, *New York City.*—Inventor.

Specimens of crystallized iron slags, from the furnaces of the American Iron Company, Newark, New Jersey.

Samples illustrating a new metallurgical process, for working ores containing copper in the form of carbonate and silicate, with iron ores. The samples are the result of the application of the process to the ore of the Warwick Mine, in Berks county, Pennsylvania, which is a mixture of magnetite with silicate of copper. They are as follows:—

1. Sample of the crushed ore.
2. The same, roasted.
3. The roasted ore, after the extraction of the copper.
4. Sample of iron, made from No. 3, by Renton's process (Class I., No. 53).
5. Slag.
6. The solution produced by the action of weak sulphuric acid upon the roasted ore, No. 2.
7. Sample of the copper produced by precipitation of the solution No. 6, by scrap iron (fused into an ingot).
8. Solution left after the precipitation of the copper from No. 6, containing copperas and sulphate of magnesia.
9. Specimen of the alloy of copper and iron, containing free copper, which is obtained by working the ore by Renton's process, previous to the separation of the copper by this process.

[The "Warwick Mine," so called in New York, although bearing throughout the surrounding country the designation of "Johannes Mine," is a very extensive deposit of magnetite iron ore, the greater portion of which is cupriferous, the quantity of copper varying from one, to probably as high as ten per cent. The company which has recently worked the mine, in searching, unsuccessfully, for continuous veins of copper ore, have laid bare a very large quantity of cupriferous magnetite, besides having taken out and piled up on the surface many thousand tons of the same ore, one pile containing alone, according to measurement, from two to three thousand tons. There are also indications which establish a probability of the continuation of the deposit, to an indefinite extent, in hitherto unexplored directions. The only process heretofore practiced in working this ore has been to crush it to coarse powder, and pass it through a magnetic machine, which of course picked out all the particles of magnetite, together with any particles of the copper mineral which might adhere to them, leaving behind a portion of the copper mineral, which was sold to the copper smelters. The magnetite ore which was picked out, was found, however, to contain too much copper to be of any value as an iron ore, and could only be used in admixture with other ores to a small extent. This new process is intended to effect a perfect separation of the two metals in this ore. There are a number of other mines, throughout the country, similar in character to this Warwick Mine, to which this process is also applicable.]

65. Lapham, J. A., *Milwaukie, Wisconsin.*

Mass of native copper, weighing thirty-six pounds, found in the drift near Milwaukie, two hundred and fifty miles from the nearest mine of native copper on Lake Superior.

[Bowlders containing metallic copper are not unfrequently found throughout the valley of the Mississippi. These are believed to have been transported by floating ice or otherwise from the region of Lake Superior. The oldest notice on record of the Lake Superior copper, as drifted from its original place, is due to Father Lewis Hennepin, who states, in 1698, in his description of the "course of the great river Meschasipi," that in the country then occupied by the Pimitewi Indians, now called Peoria, in Illinois, he found now and then, "upon the surface of the earth, several pieces of fine red copper, which made him believe that there were mines of it." This copper was probably drifted by the agencies before named from the Lake Superior region.

General Remarks on the Distribution of Copper Ores in the United States.

The ores of copper in the United States in permanent workable quantities are, so far as at present known, confined to the broad belt of metamorphic rocks along the Atlantic slope, and to the trap and sandstone formations on the shores of Lake Superior. Ores of copper, as before remarked (see Introduction), occur in the new red sandstone formation, but at the present time no veins in this rock alone are profitably wrought. The copper mines in the limestones of the lead region of Wisconsin have not yielded a permanent supply of ore, and it may be doubted if this district will ever prove remunerative in working of copper lodes. The metalliferous region of Missouri has likewise yielded copper ores in considerable quantities, but it is very questionable whether the veins will prove permanent. We still know little of the value of the copper veins in the district of country bordering on Mexico, although ores of copper have been discovered in considerable quantities, and abandoned mines of this ore attest the former knowledge of its existence in that region of country.

The most extraordinary exhibition of this metal in the Crystal Palace was from the south shore of Lake Superior. Several large blocks of native copper, cut from much larger masses in the mines, are presented from several of the veins of Kewenaw Point. One of these is especially worthy of notice (No. 61), being a block of more than two feet in thickness between its two natural faces, and cut upon the four other sides. This mass weighs 6,300 pounds, and was cut from a mass which originally was estimated to weigh 120 tons. Other blocks of native copper exhibited weigh 2,000 and 3,000 pounds and upwards.

Fine collections of native copper crystallized, and also red oxyd of copper, are exhibited from the Lake Superior mines. The black oxyd of copper, of which specimens are presented, occurs in a large vein in the conglomerate on the south shore of Lake Superior, but this mine is not wrought at the present time.

The principal copper ores exhibited are copper glance, yellow and variegated copper ores, from Bristol, Connecticut; yellow copper ore, from Ulster county, New York; sulphurets of copper, from Phœnixville, Pennsylvania; yellow sulphuret and other ores of copper, from several localities in Maryland; copper ores, from Orange county and Manassas Gap, Virginia; yellow sulphuret of copper, from several localities in Guildford and Davidson counties, North Carolina; copper ores from Tennessee and from several localities in Missouri.

Numerous other specimens of copper ores appear in the several private collections.]

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66. State of Michigan.

A mass of native copper, weighing 6,300 pounds, and cut from a mass which weighed 240,000 pounds, or 120 tons, produced by mines of the American Mining Company at Lake Superior.

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67. New York and Michigan Mining Company.—Producers. (Agent, C. M. Guild, 79 *John Street, New York.*)

A large mass of native copper, from the Company's mines at Copper Harbor, on Lake Superior, weighing 1,047 pounds, and two smaller masses.

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68. Minnesota Mining Company.—Producers. (Agent, S. M. Barry, 187 *Greenwich Street, New York.*)

Large mass of native copper, from the Company's mines at Lake Superior, weighing 5,072 pounds. It was cut from a mass which weighed, when entire, 80 tons, or 160,000 pounds.

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69. The National Mine, *Ontonagon, Michigan.*

A piece of native copper, cut from a mass which weighed 8,000 pounds, being part of a first shipment of 20½ tons of copper, the result of the first seven months' operations, the mine having been first opened September 16, 1852.

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70. Stevens, William H., *New York City.*—(Exhibited by Professor B. Silliman, Jr., Proprietor.)

A large collection of specimens of crystallized native copper and silver, from various mines in the Lake Superior region. Among them were some specimens of remarkable beauty of crystallization, highly modified, the crystals large, perfect, and of a fine copper-red color.

Native Copper of Lake Superior.

[The remarkable deposit of native copper, in the trap rocks of the south shore of Lake Superior, demands more than a passing notice among the raw products of the Exhibition. Although by no means a recent discovery, its important influence is scarcely yet beginning to be felt or appreciated. The modern mining operations,

although commenced nearly ten years since, have not reached a condition upon which we can base any reliable estimates, as to future productiveness or value, except the general fact, sufficiently apparent, that the region is one of vast, and probably inexhaustible wealth. In the earlier periods of these enterprises, much time was wasted, and money uselessly expended, in portions of the tract now known to be unproductive. The surveys undertaken by the General Government have determined many important points, in regard to the extent and distribution of the metal; and the limits of the copper-bearing rocks being now known, the more recent mining explorations have been pursued syatematically, and with better success. The result is attested by the constantly increasing product of the metal, and the discovery of new and productive veins, which are from time to time opened and explored.

The discovery of copper in that region dates back to the early period of the establishment of the French in Canada. The position of this mineral region is remote from the Colonies, and situated, as it was at that period, in the midst of a country occupied by the aborigines, it is not surprising that it led to no results. The first known discovery of this copper by a civilized nation was made, by the Jesuit Fathers, in the early part of the 17th century. The members of this Order arrived in Canada (Nouvelle France) in 1625, and their published "Relations"* extend from 1632 to 1672. We have not the means of ascertaining at what period this discovery was first announced; but M. Dufrenoy asserts, that "the antiquity of this discovery is attested in a work published in Paris, in 1626, by M. Logarde, who states that M. Truchemont Bruslé had given him an ingot of copper, obtained 100 leagues west of Lake Huron. A second notice of the existence of a mass of copper in this part of America, is given in the account published in 1666, by Father Claude Allouez, of the Mission of the Holy Ghost, at Ontaonoes, in Lake Tracy, or Superior."

The latter author gives a very circumstantial account of his journey, and of finding pieces of copper, which, he says, are preserved by the Indians, and, in some families, have descended from generation to generation, being cherished as domestic gods. Subsequent relations mention the occurrence and discovery of large masses of copper on the south shore of Lake Superior.†

The trace of these early discoveries was never lost, but the condition of the country during a long period was unfavorable to the success of any mining operation. As early as 1771, however, a mining enterprise was commenced by Alexander Henry, an Englishman, in the vicinity of the forks of the Ontonagon River. After becoming discouraged at this place, and transferring the seat of his operations to the north shore of the lake, and working for some time unsuccessfully, he abandoned the experiment, concluding that the copper could never be profitably mined till the country should become cultivated and peopled.

"In 1819, General Cass, under the authority of the Secretary of War, directed an exploring expedition, which passed along the southern shore of Lake Superior, and crossed over to the Mississippi River." One of the principal objects of this expedition was the investigation of the north-western copper mines. Mr. H. R. Schoolcraft accompanied the expedition as mineralogist and geologist. Notwithstanding that the attention of the Government was on several occasions called to the mineral resources of the North-west, still nothing effectual was accomplished.

As early as 1830, Mr. George Catlin, of New York, brought from the neighborhood of Ontonagon River a mass of native copper, weighing 130 pounds, and deposited it in the cabinet of Yale College, where it still is. It was upon this specimen that the observation was first made by Professor B. Silliman, Jr., in 1837, of the existence of native silver attached to the copper, in beads, but unalloyed with it.

In 1837, Dr. Douglass Houghton, who had previously explored this region in connection with an expedition of the General Government, was appointed Geologist of the State of Michigan. In his annual Report of 1838, he has given a hasty sketch of the several geological formations of the lower peninsula, and traced the succession in the descending order to the lower sandstones of St. Mary's River, and the southern shore of Lake Superior; distinctly recognizing this as the oldest sedimentary unaltered formation. In his Report of 1841, the geological features of the country upon the south shore of Lake Superior were, for the first time, sketched with some detail, accompanied by definite information in regard to the occurrence of deposits of native copper in these rocks, and given to the world.

Unfortunately for the continuance and completion of a work so well begun, Dr. Houghton lost his life while engaged in the arduous labors of the survey of this region.

About the same period, the "copper rock," a mass of copper of which traditionary and published accounts had long existed, was removed to the city of Washington. Since that period, adventurers and explorers have flocked to the shores of Lake Superior, as to some El Dorado, and though many have been disappointed, still, many others are reaping rich harvests from well-directed and persevering efforts. At the period of the earlier locations of mines, or mineral permits from the Government, nothing was definitely known of the extent or limits of the cupriferous deposit. Indications of veins were indiscriminately sought over the whole peninsula, from Keewenaw Point to the Ontonagon River, and even beyond these limits. A large part of the locations thus made, without guide or knowledge of the geological structure of the country, or the relations of the copper to the surrounding rocks, were subsequently abandoned; and it was not till after several years of experience, that it began to be perceived that the productive copper lodes are confined to certain kinds of trap rock. The limits of this formation began then to be sought out.

* Relation de ce qui s'est passé en la Nouvelle France.

† The masses of copper, often hammered into useful forms, found by Messrs. Davis and Squier in the Western mounds, were, in all probability, derived by the aborigines from Lake Superior.—Editor.

After the death of Dr. Houghton, the geological survey was continued, first under the direction of Dr. C. T. Jackson, and subsequently under Messrs. J. W. Foster and J. D. Whitney, who completed their labors in 1850, and their final Reports were published in 1851, with an accurate geological map of the copper region. Since that time, Mr. Whitney has continued his examinations, and during the present year, has published an enlarged and very correct map of Keewenaw Point, on which are laid down all the mines in operation at the present time, the places of known veins, and the situation of abandoned mines.

Thus, in little more than ten years from the first geological description of the region, we are in possession of accurate geological maps, and detailed reports of the entire region, with the location of nearly forty mines, in operation at the present time, upon Keewenaw Point; and others further up the lake-shore, and upon Isle Royale.

From half this number of mines, it was estimated that the product of copper, in 1851, would reach the amount of 2,500 tons; and, in the present year, the quantity will fall little short of 5,000 tons. Few of the mines have reached the limits of their productiveness; and it is impossible to predict the future rate of increase in the production of this metal from the mines of Lake Superior.

In this connection, it is interesting to refer to the accompanying statement of the production of the "Cliff Mine," one of the most successful of the Lake Superior mines. It is derived from the office of the Company, in Pittsburg, through the kindness of Thomas W. Howe, Esq., Secretary of the Company.

Product of Cliff Mine.

Year.	Silver.	Black Oxyd.	Copper Ore.	Yield in Ref. Metal.
1845,	.....	33,171	.....	19,903
1846,	290½ ounces.	10,000	98,774	37,625
1847,	390 "	.....	729,848	410,783
1848,	973¾ "	.....	1,655,304	996,467
1849,	297 "	.....	2,285,050	1,282,127
1850,	2,868 "	.....	1,521,391	714,643
1851,	418 "	.....	1,528,465	846,486
1852,	.....	.....	1,660,330	829,356
1853,	.....	Dec. 31st. smelted	2,062,958	929,615½
	.....	" " on hand	501,891	say 226,162
Total,	5,236¾	43,171	12,044,011	6,293,167½

It will not be deemed inappropriate to give here a rapid sketch of the geological features of the southern shore of Lake Superior, as presented in coasting from the Saut de St. Marie to the copper region. The shore, on the American side, at first presents low sandy or pebbly beaches, with occasional higher banks, and, finally, terminated by a bluff of gravel and sand three hundred feet high. Beyond these, succeed the stratified sandstones, called the "pictured rocks," which form high broken cliffs along the lake, and produce numerous beautiful and picturesque features in the scenery.

Between Grand Island and the mouth of Carp River, this feature of the geology gives place to rocks of granitic and sienitic character, which, with slight interruptions, skirt the shores nearly to Point Abbaye (Pt. au Baie). This belt of metamorphic rocks, thus marked along the shore, extends into the interior in a western and south-western direction, and is the formation embracing the iron ores of the Lake Superior region. Keewenaw Bay occupies a space between this and the copper region of Keewenaw Point.

Keewenaw Point, which is the great repository of the native copper, is a prominent point of land stretching into the lake, beyond the adjacent portions of the south-western shore of the lake. On its northern side, it forms the southern shore of Lake Superior for many miles, while its southern side is bounded by the waters of Keewenaw Bay. This Point consists mainly of a broad belt of trap rock, which extends centrally through its entire length, parallel to its northern shore. On the northern side, this belt of trap rock is bounded by a border of conglomerate, through which runs a narrow belt of trap rock. On the southern side, this central band of trap is bounded by sandstone, with conglomerate, towards the north-western extremity. This central mass is mainly amygdaloidal trap, with a narrow belt of crystalline trap along its center, and a broader belt of porphyritic trap upon the south side, adjoining the sandstone.

The productive veins of native copper occur in the amygdaloidal trap, and become unproductive in the crystalline trap, while the porphyritic trap bears veins of sulphuret of copper. The veins which penetrate the sandstone and conglomerate are either destitute of lodes, or yield only the ores of copper. The mine of Copper Harbor, in the conglomerate rock, which at one time was wrought as the only productive lode, yielded black oxyd and silicate of copper in considerable quantities, but this is now abandoned.

It may therefore be regarded as demonstrated, that the productive veins of metallic copper are confined to trap rocks of certain character; that the more crystalline portions, which assume a sienitic character, are unproductive, while the porphyritic varieties yield only the ores of copper. These determinations of the limits of the productive cupriferous formation are of very great importance, since the area is thus defined in which search may be successfully carried on; and while this determination may to some extent circumscribe the limits of the formerly supposed mineral region, it will, nevertheless, give right direction to energy and capital, and prevent the waste of both, in a search as useless as a search for coal beyond limits of the coal formations. Nothing can be more important, to the prosperity of the region itself, and indirectly to the country at large, than to have the true boundaries and limits of mineral districts determined by accurate geological surveys. As a case in point, we

are prepared to assert, that the surveys of the Lake Superior lands have advanced the permanent interests of that portion of the country more than half a century beyond what would have resulted from uncertain and desultory operations, like those proceeding from experimental or speculative mining enterprises.

The mode of occurrence of the native copper, in the rock, may be very well inferred from the specimens shown in the Crystal Palace Exhibition. The veins occur penetrating the trap.

The sheet of copper, which is of variable thickness, is usually accompanied by more or less of crystalline mineral matter, which divides it from the harder rock walls. These sheets of copper are from an inch, or less, to two feet thick; sometimes continuous for a long distance, while often the metallic mass thins out entirely, leaving the vein to be followed by the other crystalline materials, which likewise sometimes disappear, leaving scarcely more than a fissure to guide the miner. The lode of metal thus lost from thinning out is at last reached again, and it goes on increasing in thickness to its maximum, when it again thins out and disappears. The metallic copper, therefore, though occurring in veins which are continuous, is itself in disconnected masses, exceedingly various in size, weighing from a few hundred pounds to twenty, forty, and even eighty tons.

Since the copper cannot be removed in masses of this size, it is necessary to find the means of dividing them. Metallic copper cannot be blasted, nor broken, as ordinary ores or rocks, and other means are resorted to for accomplishing this object. The rock, and other mineral matter, is removed from around the mass, and it is either thrown down to the bottom of the mine, or, if left in its natural position, is cut into pieces of convenient size by steel chisels and hammers, as a blacksmith cuts a piece of cold iron, except that in cutting the copper a groove has to be cut entirely through the mass. This is a slow and tedious process, and adds very much to the expense of producing the metal. The masses of native copper, exhibited at the Crystal Palace, from several of the mines of Lake Superior, have been cut from larger masses in this manner, and the marks of the chisel may be seen upon the cut surfaces. The largest of these masses, weighing 6,300 pounds, is cut in this manner on four of its sides. Other smaller and thinner masses show the cut edges, and the thickness of the original mass.]

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71. American Mining Company, *Broadway, New York.*—Producers.

Specimens of ores from the various mines worked by the Company in the United States and Cuba.

a. From the Warwick Mine, Berks county, Pennsylvania.—Specimens of magnetite with fibrous malachite; magnetite with chrysocolla; with mammillary malachite; with talc; with copper pyrites; with octahedral iron pyrites; with emerald-green foliated hexagonal crystals (copper mica); dodecahedral magnetite; magnetite with copper pyrites and serpentine; specimens of trap rock containing iron pyrites; specimens of crushed ore; and of the same which has been put through a magnetic machine to separate the magnetite, and rich in copper.

b. From the Cabarrus Mine, North Carolina.—Copper pyrites in quartz.

c. From the Sharon Mine, Ontonagon county, Michigan.—Crystallized native copper in calcite; the same with chabazite.

d. From the Windsor Mine, Michigan, south shore of Lake Superior.—Crystallized native copper in quartz, with calcite.

e. From the Derby Mine, Ontonagon county, Michigan.—Native copper, with red oxyd of copper and malachite.

f. From the Norwich Mine, on the North Fork of the West Branch of the Ontonagon River, Michigan.—A large variety of specimens of crystallized native copper in serpentine rock, with quartz and calcite.

g. From the Lebanon Mine, Cornwall, Lebanon county, Pennsylvania.—Red oxyd of copper and malachite, in magnetite.

h. From Lancaster Mine, Lancaster county, Pennsylvania.—Galena with quartz, in gneissic gangue.

i. From the New London Mine, Frederick county, Maryland.—Copper glance, with malachite.

j. From the San Antonio Mine, Cuba.—Fibrous malachite, with specular iron.

k. From the San Augustine Mine, District of Bayatavo, Cuba.—Copper glance, with copper pyrites; incrustation of metallic copper on wood (?); a tube of copper containing a mass of limonite.

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72. Stanton Copper Company.

Ores from mine situated near the Merrimac River, in Franklin county, Missouri.—Veinstone, composed of calcite stained with sesquioxyd of iron; copper glance, with malachite and quartz, being an average sample of the ore.

Ores from mine situated on the line of the south-west branch of the Pacific Railroad, seventy miles south-west of St. Louis.—Copper glance, with malachite, and specimen of malachite taken from sixty feet below the surface.

Pig-copper from Stanton Copper Furnace, made by a first smelting of the ore with charcoal; slag from the operation, mostly composed of silicate of iron.

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73. Park, Andrew, *St. Louis, Missouri.*

Copper ores from Washington county, Missouri.—Malachite; malachite, with copper glance; malachite, with copper pyrites; malachite, with red oxyd of copper; copper pyrites; malachite, with copper pyrites, limonite and calcite; copper pyrites; copper-pig.

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74. Primrose, Thomas, *Missouri.*

Copper pyrites, with calcite, from the Old Mines, section No. 36, township No. 29, Shannon county, Missouri.

Specimens of malachite, copper pyrites, and red oxyd of copper, with a mass of metallic copper made from them by smelting with charcoal, from the New Mines in section No. 5, township No. 29, Shannon county, Missouri.

75. Chilton, J., *Emeuce, Missouri.*

Copper ores and calcite.

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76. ———, ———.

Copper glance; copper glance in gneiss; magnetite; foliated specular iron, from Lemesurier Mine, Lake Superior; copper pyrites in quartz, from Jackson Mine, Lake Superior; erubescite, from Inverness.

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77. Gilbert, Lyman, W., *No. 15 Insurance Buildings, New York City.*

a. Copper ores from Carroll Mines, Maryland; erubescite with copper pyrites, in quartz gangue; erubescite, black oxyd of copper, and malchite in quartz; erubescite with chrysocolla.

b. Copper ores from Potomac Mines, Maryland; massive copper pyrites; copper pyrites with calcite and specular iron; copper pyrites with magnetic pyrites.

c. From the Old Liberty Mine, Frederick county, Maryland.—Copper glance, with malachite and limonite, in quartz.

d. From the Dolly Hide Copper Mine, Frederick county, Maryland.

1. Malachite, in limonite.
2. Erubescite and malachite, in limonite.
3. Malachite, copper pyrites and silicate of copper, in quartz gangue.
4. Erubescite, in calcite gangue.
5. Galena.
6. Galena, with erubescite.

[The two preceding, together with the New London Mine in Frederick county, worked by the American Mining Company, are, according to Dr. Genth, precisely alike in geological character, but of an entirely distinct formation from that described in the last note. "They all consist of large deposits of ore in limestone or magnesian limestone, which is imbedded in a talcose slate. The New London Mine has gray sulphurets of copper." The contribution of the American Mining Company from this mine is a specimen of copper glance with malachite (No. 66, *i.*) The word *erubescite*, so often used in this catalogue, is the mineralogical name for a double sulphuret of copper and iron, which has, when freshly broken, a bronze color and metallic luster, but soon tarnished in the air, and presents an iridescent appearance, from which it was formerly called *variegated copper*. Miners call it "*horse-flesh copper ore*," from some fanciful resemblance which they find.

There is a cupriferous region upon the Blue Ridge in Virginia, reaching from near Fredericksburg for forty to fifty miles along the course of the chain. The copper appears at intervals associated with an epidotic gangue, quartz, and chlorite, in the graywacke rocks, following in the main the strike of the outcrop. It is doubtful whether any of the veins observed by explorers in this region are truly such, and it is very possible that they may be only epidotic and quartzose beds, conformable, for the most part, to the surrounding graywacke. The surface indications here are frequently very encouraging for a good supply of copper. It is very possible that valuable returns may follow their exploration. Many of the masses of copper resemble the Siberian ores, being red oxyd investing metallic copper, and coated with green malachite. There is one pretty well marked quartzose lode, with yellow copper. The Manassas Gap property is on the Orange Railway, about 70 miles from Alexandria. Erubescite and copper glance are also found disseminated through a bed of very hard graywacke, and there is a very general diffusion of copper through the whole region, as evidenced by the green coating on the weather-surfaces of many of the rocks.]

e. Collected by William P. Blake, Pn. B.
From Deep River Copper Mine, *Guildford County*, North Carolina.
Copper ores.

f. From Beck & Hadrick's Copper Mine, *Lexington*, Davidson County, North Carolina.
Copper ores and slate.

g. From the Mines of the Tennessee Mining Company, *Polk County*, Tennessee.

1. Wall rock of vein, gneiss, and mica slate.
2. Gozzan, hydrous red oxyd of iron.
3. Magnetic iron pyrites, with a portion of copper pyrites.
4. Copper glance.
5. Ores, dressed and ready for the market.

h. From the Hiwassee Mine, *Polk County*, Tennessee.

1. Copper ores; amorphous sulphuret, and a black oxyd of copper.
2. Magnetic iron pyrites.
3. Copper pyrites.

[These two mines are situated upon one and the same course, or bed, in Polk county, and in the very south-eastern corner of the State, adjoining Georgia. The rocks at the mines are micaceous and chloritic slates, probably of silurian age, but so metamorphosed as not to be referable to any subdivision of that system. There are *two* great veins, or beds of cupriferous pyrites, stretching through this region for four or five miles, preserving very nearly, as far as has been observed, their parallelism throughout their course. These two veins are about a mile from each other, and have the same course as the strata in which they are inclosed, that is, for the greater part of the distance north 20° east, south 20° west. Near the northern line of the township they both bend, and assume a course nearly north-east and south-west, but soon resume their original direction. These two veins preserve a remarkable uniformity of appearance, and, so far as can be judged, are equally valuable. The western one, however, only, has been opened to any extent (May, 1843), and on this are two or three mines, opened to the depth of eighty or ninety feet. The appearance of the veins on the surface is marked by a heavy outcrop of *gozzan* (the Cornish term for the hydrated peroxyd of iron, which results from the decomposition of pyritiferous ores). This outcrop appears chiefly on the ridges, and the ground is thickly strewn with masses of ferruginous material, over a width, in some places, of about a hundred feet. On penetrating beneath the surface, this *gozzan* is found to extend downward to very

nearly water level, filling the entire space between the adjacent walls of rock, sometimes forty or fifty feet. Beneath the *gozzan*, is found a bed, or mass of black cupriferous ore, of variable thickness and width. This, as well as the *gozzan*, is the result of the decomposition of an ore, consisting originally of a mixture of the sulphurets of iron and copper, which was associated with a quartzose gangue, or vein-stone. The place of the bed of copper ore marks the limit of the decomposition; beneath it, the ore exists in its original condition. The depth to which the decomposition has extended is variable, as it is identical nearly with the level at which water is found. On the ridges, it varies from eighty to ninety feet; in the valleys, it is nearer the surface. This black ore of copper is analogous to the "copper smut," or black copper (Kupferschwärze, of the Germans), and is a common product of decomposition of cupriferous ores, though Mr. Whitney has never seen it exhibited on so large a scale in any other locality. It is a mixture of black oxyd of copper with sulphuret of the same metal, and some silicious or earthy matter. There is, also, considerable sulphuret of iron, in crystals and small fragments, scattered through it, as well as some sulphate of copper, and perhaps a little manganese. The thickness of this deposit of black copper is very variable. Mr. Whitney thinks, however, that it cannot fall below two feet, and it is probably more. The thickness of the deposit of black copper cannot be taken as a guide to the quantity of copper pyrites which existed in the vein, when compared with the body of *gozzan* which overlies it, as a large portion of the copper has been carried away, and lost in the form of the sulphate. The water which runs from the excavations in this ore is strongly impregnated with copper, and the tools of the workmen, when allowed to remain in contact with the water, become coated with copper.

The lateral *thickness* of these veins is in some degree a matter of conjecture. In the Hiwassee mine, the black ore is said to occupy a width of forty-five feet. Assuming the very low estimate of *ten* feet for the width, and an average of only twenty per cent. copper (it is, in fact, richer), and it is found that a mile in length on the vein will give, of this peculiar black ore, over 6,300 tons of copper, worth, at present prices, not less than $750,000; and it is believed that this estimate is far within the truth. No attempt has yet been made to mine the mixed pyrites below the line of decomposition. There is good reason to believe that, whenever the black ore is exhausted, the pyrites may be worked to advantage.

These are not *true veins*, filling fissures, but are to be regarded as *contemporaneous* or *segregated* veins; similar in their conditions, in fact, to all the so-called veins of the Southern States. They are, however, developed on a scale of such magnitude, that there can be no doubt of their being continuous to a great depth, and reliable.

The great obstacle to the early and profitable development of these mines, lies in their distance from market, and consequent expense in hauling the ore by teams over rough roads. It has been, therefore, recommended to erect a suitable furnace to take all the ore from these mines, and bring it up to sixty or seventy per cent. regulus. It is believed that these mines would then stand about on a par with those of Lake Superior, as far as transportation is concerned, as they would be shipping a product of about the same percentage of copper, at about the same expense.

We have condensed the foregoing note from Mr. J. D. Whitney's lucid Report to the owners of the East Tennessee and Cherokee Copper Company. The specimens of mixed magnetic and copper pyrites, which Mr. Blake brought from the Hiwassee mine a year ago, have undergone the pyritiferous decomposition, and are all crumbling to dust. Mr. Blake stated in conversation that the odor of sulphuretted hydrogen was distinctly perceptible in the drifts of the mine, and that the temperature of the air in the passages was sensibly elevated, indicating the existence of a constant oxydation or decomposition in the mass of pyrites ore as fast as it becomes exposed to the air. Should the present water-level be lowered, no doubt the same cause would extend the change to parts of the vein yet unaffected; and it is worthy of consideration whether this circumstance may not be advantageously availed of, to bring the ore up to a certain stage of preparation, in anticipation of the time when the present accumulation of black ore (the product of ages of a like change) shall be exhausted. We must certainly regard the history of these Tennessee veins as among the most interesting metallurgical facts brought forward at the Exhibition.]

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78. North Carolina Copper Company, *Guilford County, North Carolina.*—Manager, William L. Faber. Treasurer, F. W. Cammaren, *New York City.*

Series of specimens of ore, gangue, and accompanying minerals.

1. Three specimens of hornblendic gneiss, the rock in which the vein occurs, taken at different distances from the vein.
2 and 3. Hornblendic gneiss, very much altered, nearest the vein.
5. Talcose slate, which forms the hanging wall of the vein.
6. Specimen of "fluking," or a soft decomposed talcose slate, which occurs between the vein and each of its walls.
7. Milky quartz, which forms the mass of the vein.
8. Spathic iron, in large crystals, which occurs in layers and aggregations in the vein, chiefly near the walls.
9. Iron pyrites, containing a small percentage of copper and nickel, which occurs in small quantity in the vein.
10. Pure copper pyrites, of which the vein yields on an average eight and four-sevenths tons to the cubic fathom.
11. Specimen of the vein at the depth of fifty-five feet from the surface, consisting of a mixture of copper and iron pyrites with quartz and decomposed pyrites.
12. Specimen of crystallized spathic iron in quartz.
13. Specimen of the vein at eighty feet from the surface, being apparently a mixture of copper pyrites, spathic iron, and quartz.
14. Crystals of copper pyrites in quartz.
15. Geode, containing crystals of quartz, copper pyrites, and spathic iron, the whole being an average of the poorest part of the vein.
16. Specimen of the foot wall of the vein, probably altered hornblendic gneiss.
17 and 18. Two specimens of the ore dressed and ready for market.
19. Ore of second quality, prepared for market.
20. Large mass of pure copper pyrites, weight 1,100 pounds.

[It has long been known that copper pyrites is generally found associated with iron pyrites, in the auriferous veins of North Carolina, but it was but recently made known that the copper ore was in quantity available for mining purposes. The mine from which the above specimens were sent was originally opened, with some success, as a gold mine, but the copper pyrites was soon found to form so large a proportion of the vein as to warrant the working of it for copper. The rock of the country, according to Dr. Jackson, "is a soft, bright yellowish-green talcose slate, very analogous to serpentine rock, overlaid by a variety of hornblendic gneiss, and underlaid by a fine-grained, compact hornblende and feldspar rock, analogous to greenstone, but, still, not in the form of a dike, but of a regular bed." At this mine there appears, in the midst of this soft talcose slate, a large vein of quartz, more than six feet thick, accompanied by numerous smaller quartz veins, and all abundantly intermixed with copper pyrites. There is, also, at the mine, a regular vein of pure copper pyrites, one foot four and a half inches in thickness; the large quartz vein, itself, being full of nests and bunches of the copper ore, mingled with a small proportion of highly crystallized tin-white iron pyrites, which has not been analyzed. The great cupriferous quartz vein dips, where it has been opened, north, 25° west, 35° from the horizontal on the upper side, and 45° on the lower side (a too rapid widening, as Dr. Jackson remarks, to be otherwise than local), with a tendency to become more vertical. The course of the vein is north, 45° east. It has been proved to a distance of 310 feet, but there is every reason for supposing it to be very much longer. In sinking the shaft, it is stated that 40,000 pounds of ore, yielding 2¼ per cent. of copper, were extracted, and that, in one place, a ton of copper pyrites was extracted from a space four feet wide, two feet deep, and five feet high.

Dr. Genth has supplied the following additional facts, regarding the auriferous and cupriferous quartz veins of North Carolina. He calls the metalliferous rock of the country a *diorite* (a rock composed of hornblende and albite), and states that this formation is intersected *in every direction* by quartz veins, all of which are auriferous, and all of which contain indications of copper. He thinks that most of them, after being mined to a certain depth, will be worked for copper alone. All the mines which have been opened give gold ore, yielding from $1 to $3 per bushel, between the surface and the water level. Below the water level, the quartz contains copper pyrites. It is very rarely the case that these quartz veins are composed of pure white quartz. The more common ore, called in that country "brown gold ore," is a cavernous quartz, containing quantities of limonite, which have evidently arisen from the decomposition of auriferous copper and iron pyrites, by the action of the atmosphere and water above the water level, while below it the pyrites is found unacted upon. In some veins, the auriferous pyrites is still found pervading the mass. Some think that the auriferous pyrites is distinguished by some peculiar crystallization, but Dr. Genth found the cube, the octahedron, the cubo-octahedron, the pentagonal dodecahedron, and other modifications, and all auriferous.]

General Observations on the Mining Region of North Carolina, by Dr. Genth.

The geological formation of the mineral region is a modern granite (syenite); in some counties, diorite, lined to the east of these formations with a talcose, and sometimes chloritic slate; which slate formation is sometimes intersected by South Carolina dikes of trap (diorite) and granite. Most of the veins (about 99 per cent.) are quartz veins. The veins are regular, and often can be traced for many miles. Pockets are not, however, of rare occurrence, and these are generally found in the diorite formation. Their occurrence is interesting. It is generally a diorite vein, of a paler color, and more silicious nature, which intersects the dark-green diorite, and in which, nearer to the surface, the silica is separated as white quartz. Such pockets have often splendid ores. They are of very frequent occurrence in Chatham county, and variegated and yellow copper pyrites is found there in them. In Cabarrus county, I have also observed several such pocket veins, and the first locality in which I found the new mineral, barnhardtite, so named from the estate on which it was found ($2\,Cu_2S + Fe_2S_3$ —), was a pocket vein. Most of the true veins, more especially those in the slate formation, run north 20°, 40° east; but so-called cross veins are also often found with a north-west course. The quartz rock, which mostly forms the vein-stone, or gangue, is generally (at least, in most of the good veins) separated from the diorite by a small seam of slate, often of a talcose or chloritic character. The quartz of these veins is often of a snow-white color, and does not contain a visible particle of any mineral, though it is rich enough to work it for gold; generally, iron pyrites are found in those quartz veins, but above water level they are decomposed. This decomposition is very interesting in many of the veins; the white (sometimes reddish) quartz often does not contain a trace of iron pyrites, but the space which the crystals once occupied is filled with sulphur. The quartz becomes, in this manner, rotten, and the name "honeycomb quartz" is then applied to it. Most iron pyrites yield a considerable amount of gold, which thus (by the decomposition of the iron pyrites) becomes visible to the eye, and extractable by mercury. At other places, the iron pyrites was changed into brown hematite, which also is then a very valuable gold ore. Some veins contain larger quantities of iron pyrites, and in many of those the quartz is associated with sulphate of baryta, which latter mineral then also becomes gold-bearing.

Another class of veins, in North Carolina, is the granite veins in syenite or diorite, or even granite. These granite veins consist principally of quartz, and may be mistaken for quartz veins; but close observation shows the red feldspar associated

with it, and, in several instances, molybdenite, substituting mica. Veins of this class are similar to some of the veins in Cornwall and Saxony, containing tin ores and copper minerals. In one of them, I succeeded in finding wolfram, tungstenic acid, scheelite, and a new mineral (tungstate of copper). All the veins which have been developed to a greater depth show more or less copper pyrites, and it may be expected that the greater number of the veins, worked for gold at present, will turn into copper veins. The most common copper ore is yellow pyrites; variegated copper, I found, at one place, near Pioneer Mills, Cabarrus county, in an indifferent-looking vein. Barnhardtite, I found in Mecklenburgh county, and at Barnhardt's land and Pioneer Mills (Dr. Leventhorp's mine), Cabarrus county. At the latter place, I found also black oxyd and sulphyd of copper, as well as silicate of copper. A few of the copper veins in North Carolina are already so productive as to render their working profitable. North Carolina and McCulloch, in Guilford county; Mecklenburgh, in Mecklenburgh county, are, it is believed, at present, the only ones which would pay, if worked for copper alone. The Phœnix, in Cabarrus county, will, in all probability, be a good copper mine also. What the annual produce of gold, of any of these mines, is, is a difficult matter to determine. None of the ores are worked which do not produce, at least, fifty cents per bushel (of eighty pounds); much of it is far richer, and will yield one dollar to two dollars, and even five dollars per bushel, on the average, while, occasionally, pockets are found worth $500 to $1,000 a bushel.

Somewhat different from the veins in the granite, syenite, and diorite, are those in the slate formation. In the same manner in which the former turn into copper veins, in depth, many of those in the slate formation (but by no means all) may be expected to become lead veins in depth. For instance, Goldhill, the most interesting of all North Carolina mines, may become a copper mine, but never a lead mine, though half a mile from it a lead vein is found in the same slate. Goldhill, or the slate mine, which was discovered about fourteen years ago, has been constantly worked up to the present time. There are probably six veins known at Goldhill, but only two of these are at present worked. The richest of the two is the so-called Marton, Peters & Co. vein. Its course is north, 35° east. It has been developed to a depth of 360 feet. The vein is a quartz vein, in chlorite slate, and at 360′ depth, between three and six feet wide. The ore is a mixture, often intimate, of quartz, chlorite, iron pyrites, some copper pyrites, and magnetic iron ore, with native gold. The ore is worth two dollars a bushel, in average. Much of the ore, however, goes far beyond that figure. When we say that the ore is worth two dollars a bushel, it is meant that the Company get out two dollars a bushel (leaving in the tailings two dollars more). The gold can, of course, be extracted from the tailings, but not by mercury. The vein on the Heilig land, or Barnhardt's vein, is worked to a depth of 280 feet. This vein is from one to three feet wide, and is poor as a gold ore; rich copper ores, however, have been found. At this vein, was found the graphic tellurium, associated with native gold. The slate formation extends through Davidson, Stanley, and Union counties, and, in all probability farther. In Union county, several mines have been worked for gold with great success; so have the Houri and Washington mines, and several others. The gold is mostly invisible, and large quantities can be obtained. Some of the mines in this county (for example, the two last named) are very rich, the ore yielding twenty-five dollars to fifty dollars a bushel; at others, the ore is poor, but abundant.

We will next mention a very interesting group of veins, which intersect this whole region, parallel with each other, and almost parallel with the slate. These are the zinc-blende veins, with gold and silver. The best (known) vein, of this description, is in Davidson county, familiar to mineralogists as "Washington silver mine," where magnificent cabinet specimens of lead salts were formerly very abundant. The vein, at this mine, is irregular, swelling to almost immense dimensions, and then, again, dying out at its extremities to a mere string. Many geologists have expressed the opinion that this is a pocket vein, but this opinion is erroneous. In neither direction does this vein disappear entirely, but is only reduced to the thickness of a knife-blade. At other places, in Union county, which I had an opportunity to examine, I found, perhaps, the continuation of the same vein, at one place, only a few inches thick, and about 100 yards distant it was ten feet wide. As the Washington mine is the best known of these blende veins, some particulars of its ores, and the mode adopted in working them, will not be inappropriate in this connection. The average of the ores of Washington mine (an average taken from about 3,000 tons), which was on the surface in 1849, gave, by analysis, the following quantities:—

Lead	= 19·0	per cent., or	galena	21·9	contains sulphur			2·9
Copper	= 0·6	" "	copper pyrites	1·8	" "	Cu_2S	=	0·6
Iron	= 0·6	" "	" "			Fe_2S_3	=	
Iron	= 8·9	" "	iron pyrites	17·1	" "	FeS_2	=	9·1
Zinc	= 39·5	" "	blende	59·2	" "	Zn. S	=	19·7
Sulphur	= 32·3	" "						
	100·0			100·0				32·3

This average yields about eight to ten ounces of silver (with three to four per cent. of gold) in 2,000 pounds of ore. This was the material, which the Company proposed to work advantageously, without giving the means of doing so. It is a matter of course, that ores yielding forty per cent. of zinc to nineteen of lead, can, only with the greatest difficulty, be worked for the latter metal. The modes of working such ores are various. Beyond question, the best method would be the one, the introduction of which I always recommended to the late Washington Mining Company—to roast the ore "dead," so that no particle of sulphur would remain (of course, with the help of steam, in order to make oxyds and sulphuretted hydrogen), then to separate the zinc by distillation, to tap the lead, which by this process has been reduced, and work up the residues for the remaining copper, lead, silver, and gold. There were, undoubtedly, some difficulties to avoid, and experience was required to know exactly when to stop or continue an operation, &c., but these difficulties would not be greater than with all new establishments. The Company having no money for these experiments, they were compelled to smelt and to volatilize the zinc, &c. Although it was urgently recommended to the Company to build chambers to collect the metallic oxyds, the advice was unheeded, and the volatilized oxyds were lost. They smelted, of course, with great loss of material, but recovered enough to cover cost, until a final change of policy destroyed the whole property. It may be interesting to give the analysis of some of the products of these operations, and to record, in a few words, my mode of working these ores:—

The ore was first oxydized, by roasting it in heaps about twenty feet square, and six to eight feet high. A bed of small wood was made, and, upon it, a layer of charcoal, about 3″ thick; then 10 to 12″ of ore (previously stamped and washed); a second layer of charcoal and ore; a third and fourth, &c. The wood was kindled, and thus the ore heated until it commenced to burn. This first roasting lasted about four weeks. As soon as the heap was cold, it was roasted in the same manner twice more, always selecting the completely roasted ore from the remainder. These zinc ores roast sufficiently easy if they are well powdered. The well-roasted ore was reduced in upright stack-furnaces, of about 4 to 5′ high, 30″ deep, and 24″ wide, with a crucible sole (sumpf) shaped, as in the annexed diagram. As flux, and in order to separate the metals from them, "tailings" from previous workings were used, and also iron ore from Conrad Hill (refuse ore, of course, which was too poor to work for gold); and, in addition to these, old slags from previous operations.

The following are the average analyses of the ores, which were used in several campaigns at the Washington mines (of which the full data have been preserved), in the months of May and June, 1850. The substances used had the following composition: ore, as above, but roasted, and the yield of lead reduced by roasting 8·8 per cent.; silver, per ton roasted ore, 8·1 ounces.

1. Old tailings:—

Lead	= 8·1	as carbonate and phosphate.
Copper	= 0·7	as malachite.
Iron	= 18·5	as hydrated oxyd.
Gangue	= 40	= salts, chlorite, &c.
Silver	= 5·2	oz. in 2,000 lbs

2. Iron ore from Conrad Hill:—

Iron	= 40·2	as oxyd.
Lead	= 0·6	
Silica	= 33·9	
Water	= 8·9	
Gold	= 0·000	6 per cent. gold = 0·175 oz.

3. Old slags contained:—

Lead	= 9·2	as oxyd.
Copper	= 1·3	ditto.
Iron	= 29·1	as Fe 0.
Silica	= 39·0	
Alumina, magnesia, and lime	= 12·0	
Silver	= 2·3	ounces per 2,000 pounds.

4. New slag contains:—

Silica	= 28·5	contains oxygen	= 15·8	= 3.		
Alumina	= 31·8	" "	= 14·8	= 3.		
Oxyd of iron	= 28·6	" "	= 6·3			
Oxyd of zinc	= 7·1	" "	= 1·3			
Oxyd of lead	= 1·0	" "	= 0·1		9	= 2.
Oxyd of copper	= 0·7	" "	= 0·5			
Magnesia, lime, and alkalies	= 3·6	" "	= 0·7			

This is very near in the proportions, $R\,0, Si\,O_3 + R\,0, Al_2\,O_3$.

This slag runs very well, though it has such a large quantity of alumina; but owing to the substitution of this constituent for the silica, as the electro-negative substance, we find only a very small amount of lead in it.

This slag contains 0·4 oz. of silver in 2,000 lbs.

The analysis of the matt which was produced in this campaign was as follows:—

Lead	= 13·6	per cent.,	requires S for	PbS	= 2·1	gives	15·7	PbS.
Copper	= 10·2	"	" "	CuS	= 5·1	"	15·3	CuS.
Zinc	= 2·8	"	" "	ZnS	= 1·4	"	4·2	ZnS.
Iron	= 40·6	"	" "	FeS	= 23·2	"	63·8	FeS.
Silver	= 0·058	"	= 17 ounces per 2,000 pounds.					

This matt is a mixture of the sulphyds, and by no means any thing like a chemical combination. By diluted hydrochloric or sulphuric acid, sulphyds of iron and zinc can be extracted, leaving sulphyd of copper, as a black powder, which can be easily washed off from the sulphyd of lead.

In these two campaigns, the following quantities were smelted:—

Roasted ore, 155,000; slags (half old and half new), 193,750; old tailings, 15,500; Conrad Hill iron ore, 31,000; litharge, 11,630. Result: Lead, 13,375; matt, 16,950; slags, 300,000.

Supposing, from the difference in the yield of silver in the roasted (8·1) and unroasted ore (7 to 7·5 ounces), that 200,000 pounds of ore gave the above 155,000 roasted ore, and taking for litharge (only) 75 per cent. Pb and nine ounces of silver, we find that the above quantities contain as follows:—

	R. O.	Slags.	Tailings.	Iron Ore.	Litharge.	Lead.	Matt.
Silver..	750 oz.	132 oz.	40 oz.	2.7 oz. gold.	53 oz.	824 oz.	142 oz.
Lead ..	19,000 lbs.	9,784 lbs.	1,255 lbs.	186 lbs.	8,722 lbs.	.....	2,305 lbs.
Copper	1,200 lbs.	1,646 lbs.	108 lbs.	.....	.....?	.....	1,728 lbs.

100 tons of ore yield 750 ounces of silver; fluxes, &c. 228 ounces, = 978 ounces; of which were obtained in the lead 824 ounces, and in the matt 142 = 966 ounces. The difference, equal to twelve ounces, is within the limits of unavoidable mistakes of observation, and remains in the slag, &c.

These campaigns do not show such good results with regard to the lead. 100 tons of ore contained 38,000 pounds. Half of it burned off in roasting; the roasted ore, still, ought to yield, with slags, fluxes, and litharge, 38,947 pounds of lead. There was actually obtained only 13,375 pounds of lead, and 16,950 pounds of matt, with 2,305 pounds of lead, or, in all, 15,680 pounds of lead; which shows the loss in smelting to be 23,267 pounds, and roasting and smelting, together, over 42,000 pounds. The reasons why such heavy losses were experienced at that time, were, simply, the following:—

1. Such ores cannot be smelted without a great loss in the quantity of lead—say, about twenty-five per cent., *unless* they can be worked jointly with other *richer* lead ores.

2. The "independent" smelters had the notion of burning off the zinc in roasting, and in smelting also. It is plain, that they succeeded in their object. It is unnecessary to prolong these details. It is understood that the Washington mine is now in the hands of a new Company. The experience already had by their predecessors will indicate to them, that if they do not separate the zinc (as they may do perfectly by Bradford's washing machine) they will fail, unless they make new discoveries of rich pockets of native silver.

A few words will suffice, with regard to some minerals found at the Washington mine*, and mines of similar ores in North Carolina.

1. Native gold.

2. Native silver.—At the Washington mine, silver was met with sometimes in large quantities. In one pocket, there was found a mixture of blende, with native and sulphyd of silver and galena, worth about $6,000.

The native silver near the surface was found in carbonate of lead, and generally in very thin laminæ or films; rarely, it was crystallized in minute cubo-octahedrons. When it was associated with sulphurets of other metals, it was in lumps of the size of peas and beans, sometimes filiform and arborescent; in the latter form, usually on the foot wall of the vein.

3. Silver glance, mixed with the native silver.

4. Silver ore, which I have described as probably a new mineral; a new variety of gray copper, from Cabarrus county (only locality yet known).

5. Galena.—Never occurs crystallized, but only in crystalline masses, sometimes in cauliflower concretions. The pure galena yields, in some instances, 500 ounces of silver, but such ores are very rare in this mine. In Union county, in the same slate formations, are galenas which yield, according to Shepard, a large amount of gold.

6. Blende.—Generally brown blende, finely granular, and intimately mixed with galena. Coarser blende, in some gold veins in Union county, but only in small quantities. All the blende of this region which has been examined yields silver, sometimes only one or two ounces a ton; the richest which I have assayed was 34 ounces in 2,000 pounds; this had three per cent. of gold in the silver, and came from Davidson county, from Squire Ward's mine. An interesting mechanical mixture of blende with copper pyrites is found in Davidson county, near, and sometimes at the Washington mine; it yields about seventeen per cent. of copper, and sixteen ounces of silver in 2,000 pounds of ore.

7. Copper pyrites, already alluded to; never met with in larger masses, and always mixed with blende.

8. Iron pyrites, mixed also with blende, in minute cubes; also in the talcose slate, in cubes, and combinations of the cube and the pentagonal dodecahedron. It yields but a small quantity of silver and gold at the Washington mine. The iron pyrites of Goldhill and adjacent localities is very rich in these metals.

9. Magnetic iron ore, at Goldhill (above alluded to), in octahedral crystals.

10. Brown hematite, common everywhere.

The following salts are very interesting:—

1. Scheelite ($CaO.WO_3$) in square octahedrons, of a grayish-blue color; very rare, and not enough for examination.

2. Pyromorphite, in six-sided prisms; the yellowish-green sometimes with the dodecahedral planes; of all colors and shapes. A crystal in Dr. Genth's collection is formed of an aggregate of minute six-sided prisms, is about one inch diameter, by half an inch high. It has a somewhat chamois color, and is associated with orthoclase and quartz. It is interesting that the latter minerals seem to have undergone the action of H Fl. It will be of a great deal of interest to examine carefully the phosphates of the Washington mine, with a view to detect some interesting substitutions of iromorphous bases which may be expected. The green varieties, and greenish-brown, is also found at Ward's place and McMakin's, in Cabarrus county; the brown variety in Union county, at Steward's mine.

3. Another phosphate, found at the Washington mine in a talcose slate, is wavellite, in botryoidal forms, but sometimes in very minute, but nice stellated crystals.

4. The carbonates of lead of the Washington mine were found in great abundance, and beautiful crystallizations, in its early history, but have long since been exhausted.

5. The sulphate of lead (anglesite) is rare, and also found at the Washington mine in cavities of blende. It is the prism, with no other combination but plane, and the crystals are small, and not very distinct.

6. Sulphate of copper is sometimes found, in well-defined crystals of the common form, in the forty-feet level of the Washington mine.

7. A brown garnet is sometimes mixed with the ores of the Washington mine, in regular dodecahedral crystals.

* A full suite of the ores of Washington mine were shown by Mr. Roswell Ving, once owner of the property (see No.). Some of the rarer of its ores, mentioned by Dr. Genth, were included in his special collection (No. 165).

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79. Patapsco Copper and Cobalt Company.—Producers. (Superintendent, Edward Remington, *Finksburg, Carroll County, Maryland.*)

Malachite, concretionary forms from the Orchard vein; copper pyrites, from Middlesex vein; specimens from Windsor vein; wall rock and gangue; gozzan; fibrous malachite; azurite (?); copper glance, compact and amorphous; erubescite; epidote.

Specimens of Carrollite (a new cobalt ore). Large rock of pure copper pyrites, weight 3,500 pounds.

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80. The Association, &c.—Collected by Dr. F. A. Genth, *of Philadelphia, Pennsylvania.*

a. From the Springfield Copper Mines, near Sykesville, Carroll county, Maryland.

1. Copper pyrites, with octahedral iron pyrites.
2. Copper pyrites.
3. Azurite.
4. Carrolite, with octahedral iron pyrites in quartz gangue.
5. Magnetite, with native gold.

b. From the Mineral Hill mines, Carroll county, Maryland.

1. Magnetite.
2. Copper pyrites.
3. Black oxyd of copper, with chrysocolla.
4. Carrollite, with copper pyrites.
5. Erubescite, with copper pyrites and talc.
6. Copper pyrites, with talcose gangue.

[There is a striking resemblance between the ores collected from several of the mines in this district of Maryland, as is seen upon a comparison of the last four or five collections. Speaking of these mines, Dr. Genth (private communication) remarks:—

"There is, in this section of the country, one great region consisting, generally, of talcose, but, in some places, of chloritic or hornblendic slate, with large parallel metalliferous veins. I believe that the ores from the Springfield, Carroll, Patapsco, and Mineral Hill mines, belong either to one and the same vein, or to veins running parallel to each other, and bearing the same minerals. None of these veins have been worked to a sufficient depth to indicate what their full value may be. The vein or veins appear to run in a north-easterly and south-westerly direction. The most north-easterly opening is at the Patapsco mine; next to it, I think, the Mineral Hill; next, the Carroll; and the most south-westerly, the Springfield mine, near Sykesville. The distance from the Patapsco to the Springfield openings is about ten miles. It is an interesting fact, that the top of the vein is magnetite, and sometimes polarized (loadstone). At the Carroll, there is a quartz with specular iron, but very subordinate. Epidote occurs at the Carroll and Patapsco. There is native gold in the magnetite from the Mineral Hill and Springfield, which, I have no doubt, was originally in solution, and, in passing through the magnetite, was reduced by its protoxyd of iron; thus, in some specimens, a pulverulent brown sesquioxyd is found with the gold. This gold has never been observed below a depth of fifty feet, and although some specimens are very rich, it is probably never in sufficient quantity to be worked to advantage. Next below the magnetite, in the vein, is found quartz with magnetite and erubescite (except at Springfield); next, copper pyrites, cobalt ore, and iron pyrites. At the Carroll, they are not yet deep enough for the copper pyrites and cobalt ore, but all the other localities have them. The cobalt minerals, however, are very rare, and none of the mines can properly be called cobalt mines. The iron pyrites in the Springfield *suite*, however, has a reddish tint, which may be an indication of the presence of an important amount of cobalt." It is evident, from Dr. Genth's valuable notes, that this region deserves a far more thorough exploration than it has received. Other points may be found where the vein or veins in this large metalliferous system may be opened to advantage. If the auriferous magnetite which forms the upper part of the veins be available in quantity and quality as an iron ore, the paucity of the gold may not be so important. The *carrollite*, which is the principal cobaltiferous mineral in this formation, is a new mineral, which has been found only at these localities. Although, as Dr. Genth states, not abundant, it is still, in addition to the copper ores, of more or less value.]

c. From the Works of the Baltimore Copper Company, *New Canton*, Maryland.

Specimens of the copper ores used, and samples illustrating the smelting and refining processes.

1. Copper pyrites, from Cuba.
2. Erubescite, from Chili.

3. Malachite, from the West Coast of Africa.
4. Crystallized slags from the ore furnace.
5. Average slag from the ore furnace.
6. Slag from silicious ores.
7. Matt from the ore furnace.
8. Matts from the first, second, and third roastings.
9. Specimens of the slags from each of these matts.
10. Crude metallic copper.
11. Slag from the crude metal.
12. Refined copper.
13. Slag from refined copper (apparently, almost pure red oxyd of copper).

Collected by Mr. LUDWIG STADTMULLER.

d. From the East Haven Copper Smelting Works, New Haven, Connecticut.

1. Copper ore, from Coquimbo, Chili.
2. Metallic copper, smelted at Coquimbo, Chili.
3. Copper ore, from Bristol, Connecticut.
4. Copper ore, from Hiwassee mine, Tennessee.
5. Copper ore, from Warwick mine, Pennsylvania.
6. Ore ready to be put into the furnace for the first smelting.
7. Calcined ore.
8. Mottled "regulus" (from rich ores).
9. Mottled "regulus" (from poor ore).
10. Slags.

e. From the Manassas Copper Mine, Manassas Gap, Fauquier county, Virginia.

1. Copper ores.
2. Native copper.
3. Copper glance.
4. Malachite and red oxyd of copper.

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81. SHELDON, H. H., *Bristol, Connecticut.*—Agent.

Copper ores of the Bristol Copper Mine, viz. :—

Copper glance, horseflesh copper, yellow copper, from various parts of the mine.

Specimens of the gangue (protogene granite), and flukan, and associated rocks.

Coarse and fine dressed ores from the jiggers, puddled ore, and slimes.

Copper glance, in large and magnificent crystals, with quartz and calcite; botryoidal and arborescent copper pyrites, and crystallized copper pyrites in quartz.

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82. UNION COLLEGE, *Schenectady, New York.*—Proprietors.

Copper ores, from Bristol Copper Mine, Bristol, Connecticut, viz. :—

Unique and splendid crystals of copper glance, both isolated, and implanted in groups on a white quartzose gangue, offering the most superb examples of this species, it is believed, that have ever been seen.

Other ores of the Bristol mine above enumerated.

[Bristol copper mine has been before alluded to (see introduction page), as occurring in the newer metamorphic rocks of Connecticut, near the western margin of the new red or trias of the Connecticut valley. The main shaft is sunk in the sandstone, and passes into the metamorphic rocks which underlie the sandstone (at an angle of 30° south-east, with a north-east and south-west strike), at a depth of about 270 feet or 45 fathoms. The predominant rock of the metamorphic series at this place is a coarse silvery mica-schist, generally accompanied with garnets. At the mine, beds of a finer grained, more fissile schists occur both lighter gray, and more quartzose and darker gray subfeldspathic and gneissoid. The mine is opened upon a large vein, of a coarse reddish subtalcose granite (protogene), adjoining which, the gneissoid rock, just referred to, is also taleose and chloritic, with decomposed greenish chloritic seams and nodules ("*flukan*"), and with more or less copper glance and pyrites disseminated in it. The richest deposits and nests of copper have been found in the coarse reddish granite before named, which may be regarded as the vein, properly speaking. It is the great size of this vein, and the unequal diffusion of the copper through it, that has been the great obstacle to profitable mining at Bristol. At times, the copper glance (which has always been, with a certain portion of purple copper, erubescite, the prevailing ore here) has been found in such large and continuous masses, or nests, as to make the yield for weeks very large. Again, it is poor and requires the raising of large quantities of barren gangue. During the past year, the character of the vein has decidedly improved, and the monthly yield of the mine has been very steadily some $1,400 to $1,500 net profit, above all charges. During the period of ten years, in which it has been wrought as a mine, it has paid rising $200,000 return value, but upon what sum expended it is not known. The average richness of the ore, as it is sent to market, is thirty per cent. New and powerful pumping machinery, driven by water, has just been completed, and is about going into operation (April, 1854). With this, and the improved arrangements for washing with Bradford's machines, it seems certain that the monthly returns (already very encouraging) must increase. With the access of this efficient power, the sinking of the shaft, which has been intermitted for three years, will be resumed, and the lode may then be proved at greater depths. The ores of this mine bear an enviable reputation in the market, being well dressed, and free from all troublesome admixtures, as of arsenic, antimony, &c.

Levels have been driven from the main shaft at twenty, thirty, and forty fathoms, on the course of the lode, to the distance of some 500 feet in the longest reach. The ore is almost entirely confined to the primary, although some valuable nests have been found in the secondary. Ventilation has been effected in the 20-fathom level by a new shaft, some 400 feet north of the main shaft; this new shaft has been sunk to the depth of 135 feet. At present, some sixty or seventy hands are employed in and about the mine.

Bristol mine has become classic ground in the memory of all mineralogists, having been the source of the most abundant supply of fine crystals of copper glance ever obtained; and there are probably few cabinets in the world that do not owe their chief attractions in this species to Bristol. The display of this mineral in the Crystal Palace was truly magnificent, embracing, as it did, many of the largest and finest specimens ever found, selected from the cabinet of Union College, whose venerable President, Dr. Nott, is the proprietor of Bristol mine.]

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83. WHEATLEY, CHARLES M., *Phœnixville, Pennsylvania.*—Manager and Proprietor.

a Copper ores from Morris copper mine, Chester county, Pennsylvania, viz. :—

Copper pyrites, gozzans and quartz veins-tones, dressed ores, maps and plans of the mine and under-ground workings.

Elevation and plan of the engine.

b. Copper ores from the Perkiomen and Aeton mines, in Montgomery county, Pennsylvania, viz. :—

Copper pyrites, malachite gozzans, gangue stone, heavy spar, molybdate of lead, &c.

c. From the Wheatley silver-lead mines.

1. Twenty-four specimens of magnificent crystallizations of pyromorphite (phosphate of lead), of an olive-green color, associated with quartz.
2. Twenty-eight specimens of anglesite (sulphate of lead), unique for beauty of form, transparency, and interesting crystalline forms.
3. Eighteen specimens of white lead ore (cerusite) in fine crystals.
4. Ten specimens of red chromomolybdate of lead (chromiferous wulfenite) peculiar to this locality.
5. Copper pyrites, native sulphur, and zinc-blende.
6. Specimens of cavernous quartz vein-stones and gozzans.
7. Argentiferous galena—numerous masses, one of which weighed 1 200 pounds.
8. Heavy spar, quartz crystals.
9. Dressed ores of galena and phosphate of lead, ready for smelting.
10. Pigs of lead extracted from the ore.
11. A mass of pure silver, weighing 75 ounces, extracted from the lead by Pattinson's process.
12. Plans, sections, and sketches of the mines, and under-ground workings, and elevation of the engines in use.

d. From the Brookdale silver-lead mine.

Pyromorphite; cerusite; anglesite; rich argentiferous galena; dressed ores; gozzans; vein-stones; maps, and plans of the mine, and under-ground workings; and plans of engines. This mine is on an extension of the same vein as the "Wheatley."

e. From the Charlestown silver-lead mine.

The same suite as from the Brookdale. This mine is on a vein three-fourths of a mile south from the two last, but parallel to it.

[The collections of this exhibitor formed the most attractive feature in the cabinet of the Exhibition, both as objects of general interest, and illustrating, in an admirable manner, a mining region of peculiar interest and promise. The whole collection was equally valuable to the man of science and to the practical miner.

The geological formations productive of lead ores in workable quantities, in the United States, are the older and newer metamorphic rocks; the lower silurian rocks, both in localities where partially metamorphic, or where wholly unaltered, and in upper silurian rocks. Also in the carboniferous limestone, and, incidentally, where penetrated by veins from the older formations, the new red sandstone.

Sulphuret of lead occurs as mineral specimens in nearly every rock of the geological series, particularly in calcareous rocks, and is, after iron, perhaps more widely diffused than any other metal. In some instances, its production is of very modern origin.

The principal productive lead mines of the United States, until recently, have been those of Wisconsin, Illinois, Iowa, and Missouri, which occur in lower silurian limestones.

Having already given a pretty full notice of the Wheatley mines, in the "Illustrated Record," page 57, it is unnecessary to repeat what we have there said. The notice alluded to is accompanied by drawings of the engines in use at three of these mines, and a tabular statement of their "duty."

It is proper to add, as several months have elapsed since the publication alluded to, that these mines, and particularly the lead-bearing portion of the lodes, have continued to improve, and that they have been actively explored with the most encouraging results.

"The value and importance of the objects exhibited from the Wheatley mines, the superior excellence of the specimens and prepared materials, the fullness and exactness of the plans of the mining operations, drawings of machinery, &c., together with the fact that this exhibition is the result of mining operations, due entirely to the labor and skill of the exhibitor, and constitute a positive addition to our previous knowledge of the resources of the country, claim from the jury the highest award, viz., the SILVER MEDAL."—*Extract from Report of Jury on Class I.*

We have received from Mr. Wheatley an account of the amount of ground driven sunk, and stoped at these mines, up to the 17th of April, as follows, viz. :—

Wheatley Silver Lead Mines.

PHŒNIXVILLE, CHESTER COUNTY, PENNSYLVANIA, 17th April, 1854.

	Fathoms.	Ft.	In.	Feet. Inch
Sanderson's engine-shaft, for new 80-inch cylinder engine sunk from grass,	10	0	0	60
Cocking's engine-shaft (on which is a 24-inch cylinder bull-engine, 60-horse high-pressure), is sunk from grass,	50	0	0	300
Whim-shafts, No. 1, for hauling ore	39	4	0	238
Whim-shafts, No. 2, for " "	29	3	0	177
Ventilation-shafts	35	0	0	210
Ten-fathom level, east and west of engine-shaft cross-cut, has been driven on course of lode,	208	2	0	1,250
Adit-level has been driven	220	0	0	1,320
" driving on branch at 10-fathom level	11	0	0	66
Twenty-fathom level has been driven east and west from engine-shaft cross-cut,	130	0	0	780
Thirty-fathom level, driven east and west from engine-shaft cross-cut,	68	0	0	408
Fathoms	800	9	0	4,809 feet.

	Fathoms.	Ft.	In.	Feet. Inch.
Brought forward....	800	9	0	4,809
Forty-fathom level; just began to drive on this level, which is extended	5	0	0	30
Cross-cuts from engine-shaft to adit, 10, 20, 30, and 40 fathom levels,	64	3	0	387
Cross-cuts from levels to branches	20	2	0	122
Winzes. We have risen and sunk winzes to the different levels—say	73	2	0	440
Stopes. There have been stoped the following ground:—				
From adit to surface	100	0	0	600
10-fathom level to adit	695	0	0	4,170
20-fathom level to 10-fathom level	794	0	0	4,764
Fathoms.....	2,553	4	0	15,322 feet.

Ore raised to 31st December, 1853, about 1500 tons; sold during 1853, 1000 tons phosphate, carbonate, sulphate, and galena.

Machinery.—A 60-horse power high-pressure engine, as described in "Record," p. 57 on Cocking's engine-shaft; works 14-inch plunger; thirty fathoms in one column; and 12-inch drawing-lift, ten fathoms. The 80-inch cylinder for Sanderson's shaft will be up this summer. We have two water-wheels: one, thirty feet diameter, two feet breast; one, ten feet diameter, twenty feet breast. The large one works six heads of stamps and a crusher, the small one works the *trunks* and *round cuddle*.

Brookdale Silver Lead Mine.

(On the same lode as the former.)

	Fathoms.	Ft.	In.	Feet. Inch.
Smith's engine-shaft, from grass	30	0	0	180
Whim-shaft, from grass	19	0	0	114
Fifteen-fathom level has been extended east and west on lode,	120	0	0	720
Adit-level, driven west	58	0	0	348
Thirty-fathom level, driven east and west in lode	63	0	0	378
Cross-cut 15-fathom level	7	0	0	42
Rises and winzes	44	0	0	264
Stopes. There have been stoped for ore	150	0	0	900
Fathoms.....	489	0	0	2,934 feet.

Ore, about 150 tons raised.

Machinery, 60-horse high-pressure engine, as described in "Record."

Total amount of ground excavated in Brookdale mine to date, 489 fathoms, or 2,934 feet.

Charlestown Silver Lead Mine.

(Lode south of the two former.)

	Fathoms.	Ft.	In.	Feet. Inch.
Wheatley's engine-shaft	37	3	0	225
Three ventilation-shafts	28	5	0	173
Adit-level	243	5	0	1,463
Ten-fathom level, east and west	71	5	0	431
Twenty-fathom level, east and west	44	0	0	264
Cross-cuts	26	5	0	161
Winzes	25	2	0	152
Stopes, about 70 fathoms stoped	70	0	0	420
Fathoms.....	548	1	0	3,289 feet.

Ore, about 100 tons raised.

Machinery a low-pressure 60-horse engine, as noticed in the "Record."

Morris Copper Mines.

	Fathoms.	Ft.	In.	Feet. Inch.
Morris' engine-shaft	30	4	0	184
Fifteen-fathom level	89	0	0	534
Thirty-fathom level	35	5	0	215
Winzes	2	1	0	13
Cross-cuts	11	1	0	13
Stopes. There have been stoped	44	0	0	264
Total amount of ground excavated, fathoms..	212	5	0	1,277 feet.

Ore. 150 barrels shipped to New York; about 30 tons on surface, to dress.

Machinery. A powerful high-pressure engine, 150-horse power, 28½ inches cylinder left stroke, has been erected, and works splendidly; the pumps are drawing lifts 16 inches in diameter.

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84. Ulster Mining Company, *Elenville, Ulster County, New York.*—(Secretary, S. H. Butterworth, 30 *Nassau Street, New York.*)

Mass of galena with copper pyrites, weighing three tons, being a portion of a larger mass, at the mines, weighing 16,792 pounds.

Copper pyrites, in very large and perfect crystals, with crystallized quartz of great beauty.

Dressed ores of lead and copper pyrites, separated by jigging.

[The Ulster mine is situated at the east side of one of the chains of the Schawangunk mountains, about a fourth of a mile east from Elenville. The ore is found in a sandstone of the carboniferous era, resembling the upper coal sandstone of Pennsylvania. The ore occurs in nodules, nests, and caverns in this sandstone, which, wherever the ore is present, is very solid and hard, and more generally of a darker color. There is no regular vein or wall. Wherever the ore occurs, the sandstone presents crystals of iron pyrites (pentagonal dodecahedra), with dark-brown crystalline blende surrounding the galena, which is mixed with copper pyrites. The magnificent crystals of copper pyrites and quartz, which have been brought from this mine, were found in a cavern. Mr. G. J. Brush detected, adhering to some of the quartz crystals, very highly finished crystals of brookite (oxyd of titanium). The galena appears to be an abundant deposit. Most of it is of a coarse grain, but fine granular galena is also observed there. It has not been tested for silver. It is so free from foreign admixture that it requires but little dressing, and the larger part is prepared for the smelting furnace simply by the hammers. The copper has not been, as yet, sufficiently abundant to deserve particular attention. Such a deposit of ore in rocks of this age is extremely interesting. It is smelted on the ground, by the Scotch method, using pine wood as fuel. The process is very wasteful, a large loss of lead resulting from volatilization of the metal, owing to the overheating of the furnaces.]

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85. Middletown Silver-lead Company, *Middletown, Connecticut.*—(Dwight Johnson, Secretary, *New York.*)

Argentiferous galena; granular, and other varieties in quartz, with a little yellow copper.

Specimens of dressed ores from the stamps.

[This mine is situated about two and a half miles south-east of Middletown, near the Connecticut River. The main vein runs nearly with the strata of the silicious slate in which it occurs, viz., in a north north-easterly direction, and dips west, at an angle of about 45°. The vein-stone is chiefly crystalline quartz, occasionally intermixed with calcite, and more rarely with fluor spar. It is compact and hard. The vein varies from one and a half to three feet in width, but may average about two feet. The chief ore is argentiferous galena, yielding from forty to seventy ounces to the ton. Zinc-blende, antimony glance, copper, and iron pyrites, are also found intimately associated with the galena. A shaft has been sunk on the course of the main vein to the depth of 175 feet, and they are driving levels on the course of the vein. It is considered as having returned good encouragement for the extent of the explorations.

Another vein, running nearly east and west, has not yet been explored. It is believed that, when this vein cuts the main lode, rich ores will be found.

A third vein, running nearly north and south, is said to carry native silver, but has not yet been explored.]

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86. Southampton Lead Company, *Southampton, Massachusetts.*—Producers. (Agent, Samuel Pinch, *Southampton.*)

Galena in quartz; dressed ore; galena, in quartz, with copper pyrites; quartz containing impalpable black powder.

[This mine is situated on a powerful vein, long known to those interested in such matters. It occurs in granitic gneiss, eight miles from Northampton. It is six or eight feet in thickness, and is known to extend for twenty miles; from Montgomery, on the south-east, to Hatfield, on the north-west. It has been opened at many intermediate places, and it is possible that these are not its ultimate limits. Its walls are very distinct and well defined. They are generally parallel, and dip at an angle of about 80°. The gangue is crystalline quartz, very hard; associated, are heavy spar, calc spar, copper pyrites, zinc-blende, and manganese. There is a crystalline tendency everywhere manifested in this vein, which is a great facility to the miner in his explorations. The galena is both foliated and steel-grained, and bears but a small proportion to the whole vein; it is segregated chiefly on the eastern wall. This vein was opened before the American Revolution, and again in October, 1809. Professor Silliman, Sr., reported on it in May, 1810. [See Bruce's American Mining Journal.] Its exploration was abandoned soon after, and the mine has lain dormant until taken up by the present Company, who are prosecuting the work with vigor. The result of eleven cupellations gave Professor Silliman, in 1810, the proportion of about twelve ounces silver to the ton of lead, or 1-2423rd part.

The Southampton vein is only one of a system of parallel similar veins in Hampshire county, Massachusetts. They all bear a great general resemblance to each other, occurring in the newer metamorphic rocks—mostly, in mica slate; and all follow very much the same north-east and south-west course. As a group, they are hard and compact veins, showing little *gozzan*, and but small sprinklings of ore (galena) in the outcrop. They have not, however, received any suitable exploration, except the one at the head of this article.]

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87. St. Lawrence Mining Company, *St. Lawrence County, New York; 17 Insurance Buildings, New York City.*—Producers.

Lead ores from Macomb mines, St. Lawrence county, New York.

Galena with calcite; limestone, used as flux; dressed ores; refuse, consisting chiefly of calcite; pig lead.

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88. Great Northern Lead Mines, *St. Lawrence County, New York.*—Collected for the Association, by Dr. F. A. Genth.

Lead ores from the Rossie mines, St. Lawrence county.

Galena, with *gozzan;* average ore, containing fifteen per cent. of lead; fifty per cent. ore; eighty per cent. ore; crystals of galena; calcite crystallized in scalene dodecahedra; crushed, dressed, and washed ores; slag; pig lead.

[These last two mines both occur in the older metamorphic rocks of northern New York. The lodes are granular and crystalline calcite, carrying galena in syenite. The Great Northern Lead Company work two veins, one being called the "Coal Hill Mine," and the other the "Union Mine." At the latter, the lode is about two and a half feet thick, yielding on the average about fifteen to twenty per cent. of lead. The calcite is easily crushed, and, by its much less density, is readily separated from the galena by any of the usual processes of washing ores. This Company have lately erected furnaces of a peculiar construction (already, however, in use in Great Britain), having chambers in the rear for condensing the "lead fume" (oxyd of lead), the product of volatilization of a part of the lead in the reducing chamber. These mines are well known to all mineralogists for their beautiful crystals.]

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89. Wythe Lead Mines, *Wythe County, Virginia.*—Producers. (Agent, Thomas Monahan, 165 *Front Street, New York City.*)

Calamine, and electric calamine with galena and quartz.

[The Wythe lead mine is situate on the east side of the New River, in Wythe county, Virginia. Magnesian limestone is the general formation in which the veins of lead ore are found. There are three veins, on which several shafts have been sunk; the strike or direction of the most regular one, called the *Long Hole vein*, is north, 52° east; the dip south-east, at various inclinations of from 15° to 60°. This vein has been worked on, for nearly one mile, from east to west, and one section of the works is connected, for nearly 1,000 feet, which is being worked now to water level (150 feet below surface); the average width of this vein is one foot. The direction of another vein (called the Whim vein) is south, 85° east; dip north, inclining from 20° to 60°. At the low grades of inclination, it forms large deposits; the widest worked was fourteen feet thick, at a depth of 184 feet; this vein is open for about 300 feet, at a depth of 191 feet. The third (called the Bald Hill vein) runs nearly parallel with the Long Hole vein, and has the same dip; at the point of intersection with the Whim vein a large deposit of ore was formed, at a depth of from 60 to 100 feet. Independent of these veins, there occur, in the ground between the outcrops of them, large deposits of ore not connected with the veins, lying in a funnel or cup shape, from a depth of 20 to 120 feet. The mine is worked exclusively for lead ore (though large deposits of iron ore are frequently met with). The ores from the veins are chiefly sulphuret of lead. The large specimen of steel-grained, weighing over sixty pounds, and a specimen of the same ore in box No. 1 b, are from the extreme east end of the Long Hole vein. One specimen of broad-grained galena, in carbonate of lime, from the same vein, west end, and the specimen of cubical pure galena, and the specimens of compact carbonate of lead in box No. 6, and one in No. 2, are from that part of the same vein which is worked now. The sulphurets with crystals of carbonate of lead are from the Whim vein. The carbonates and oxyds in boxes No. 2 and 3 (with the exception of one specimen of compact carbonate of lead) are from deposits between the veins. The produce of the mine is from 500 to 700 tons of lead annually. The average produce of the ore, as it comes from the mine, is 13 per cent. of lead. The ores are generally accompanied by iron, carbonate of lime, and gozzan, as per specimens in box No. 4, which also contains specimens of the various vein-rock. The deepest shaft used, both for drawing ores and water from the mine, is, on the Whim vein, 191 feet deep. The depth of the level or adit is 241 feet (15,274 long); at the termination of the adit is a perpendicular shaft, 6 × 8 feet, connecting with it, part of which is used instead of a shot-tower. There is but little water at the depth to which the mine is worked, not exceeding 15 gallons per minute. The number of men and boys employed in mining, washing, and smelting, is 130; their average wages, 60 cts. per day.]

90. Mosely, G. W., & Co., *Neosho, Newton County, Missouri.*

a. Specimens illustrating the lead formation of Missouri.

Specimen of the lead-bearing rock of Missouri, from Perry's mines, St. Francis county, Missouri; specimen of the rock which lines the lowest cavities, 170 feet below the surface of the earth, from the same locality; dolomitic limestone with chalcedony, and a specimen of the dolomitic rock, which is found just above the ore, from the same locality.

Galena with cerusite, from McCormack's mines, St. Francis county, Missouri.
Galena from Tarpley's mines, St. Francis county, "
Galena from Vallée's mines, St. Francis county, "
Galena from Wet Diggings, Washington county, "
" " Kendall's " " " "
" " Haydon's " " " "
" " Masson's " " " "
" " Rocky " " " "
" " Lambert's " " " "
" " Shaft " " " "
" " Shibboleth " " " "
" " Williams' " Franklin " "

Specimens of galena and metallic lead, from Mosely's Furnace, Newton county.
Electric calamine from Washington county.
Specimens of galena from Center Creek and Turkey Creek, in Newton county.

b. Specimens from Mine la Motte, Missouri.

Galena; copper pyrites, with galena; pyrites containing cobalt and nickel; black oxyd of cobalt; specimen of the substance called "dry bones" by the miners (calamine). Copper pyrites, with malachite, from Deep Diggings.

[The mines of Missouri were discovered in 1720, by Francis Renault and M. La Motte; they are situated in the counties of Washington, Jefferson, and Madison. The ore occurs in what has been called the "cliff limestone," but which is, in reality, a distinct member of the silurian beds between the Hudson River and the Trenton groups, associated with blende, calamine, carbonate and sulphate of lead, pyrites, and often an ore of copper and cobalt. The lead-bearing region of the Western States is in Missouri, Illinois, Iowa, and Wisconsin. The Wisconsin lead region, according to Dr. D. D. Owen, comprises sixty-two townships in Wisconsin, eight in Iowa, and ten in Illinois, being eighty-seven miles from east to west, and fifty-four from north to south. The metal does not occur in veins or lodes, but is found loosely disseminated in the clay. It is wrought by diggings, and not by regular mining operations. There is scarcely a square mile of all the region where lead may not be found. The adventurers (it is not proper to call them miners) judge of the probable presence of galena by the red color of the soil on the surface, arising from the ferruginous clay in which the ore is often imbedded; fragments of lead or of calc spar; a line of depression or elevation from the general surface, with "sink-holes," and the linear arrangement of trees and plants, all serve, to the acute observer, as indications of the course of a vein. The diggings seldom exceed twenty-five or thirty feet in depth. Over 3,000,000 pounds of ore have been raised from a single spot, not over fifty yards square. A fair day's work, in diggings of average productiveness, has been regarded as 500 pounds. The annual product of lead from the West is gradually diminishing, at least such has been the general statement of late years. Dr. D. D. Owen, in his able Report on Wisconsin, &c., gives (page 61) a table of the shipments of lead from Galena and Dubuque, and all other points on the upper Mississippi, for the years 1841 to 1850, inclusive. The footings for these years are as follows, in pigs of lead averaging seventy pounds each, viz.:—

1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.
452,814	447,859	561,321	624,601	778,460	730,714	771,679	680,245	628,934	569,521

It appears from this that the annual produce has varied, in the last ten years (ending 1851), from about thirty-two millions to upwards of fifty-four millions of pounds. The decrease in the production of 1848, '49, and '50, is in part attributable to the number of miners volunteers in the Mexican war, and in part to emigration to California.

Dr. Owen expresses the opinion, founded on more recent observations, and discovery of crystalline plutonic or trappean rocks, in some parts of the Dubuque and Mineral Point districts of Wisconsin, that this region is based on a syenitic and granitic platform, which, in all probability, would be reached by penetrating from two to four thousand feet. These facts must be regarded as favorable to the continued productiveness of the lead-bearing region, and we may expect that new supplies of galena, and probably of copper, will be found by deep mining. The quantity of silver in the Western galena is far too small to be worked with any profit.]

91. Cooledge, E.

Lead ores, &c., from Sandy mines, Jefferson county, Missouri.
These mines are not worked at present, on account of water.
Wall rock; calcite; galena; calamine; galena, with calamine; clay, found over the ore; galena, taken from a pocket.

92. Rogers, Charles H., & Co., *New York City.*

Galena from Illinois.

93. Jefferson, Crawford & Co., *Wisconsin.*—Producers.

Large mass of galena.

94. Bracken, John, *Minnesota.*—Producer.

Specimens of pure galena.

95. Chatham Cobalt Company, *New York City.*—Producers.

Cobalt ores, from Chatham, Middlesex county, Connecticut.

a. Specimens from the old mine.

1. Ore from the outcrop (nickeliferous mispickel), decomposed by the action of the air.
2. Ore from two fathoms below the surface; nickeliferous mispickel, with smaltine.
3. Ditto.
4. Three fathoms below the surface, mispickel with cobalt ore.

b. Specimens from the new mine.

1. Specimens of ore, stamped and washed free from the gangue, composed of smaltine, and ready for market.
2. Specimen of the vein near the surface, cobalt bloom.
3. Smaltine, disseminated through gneiss, with garnets and black mica.
4. Specimen of the vein composed of gneiss, with disseminated smaltine, and exhibiting a contortion which the vein has undergone.

[The principal ore of cobalt in the United States, and the only one hitherto of economical importance in this country, is the black oxyd of cobalt, or earthy cobalt, which, in mixture with the oxyds of manganese, iron, copper, and nickel, occurs in considerable quantities at Mine la Motte, in Missouri. The same ore occurs at Silver Bluff, South Carolina. The true geological position of this ore is not fully established, but its present condition is probably a derivative one, and of very modern origin.

The ore at this mine is diffused, in minute grains, through a gneissic rock, often in almost impalpable powder. The mineral species to which this ore is referable, is called *cloanthite*, of which it is a ferruginous variety. This is clearly shown by the following analyses, made by Dr. F. A. Genth, for this catalogue, and communicated to the Editor. No. 1 is a sample collected by Professor Dana, at the mine, and No. 2 is a sample washed by Bradford's machine, and obtained from an independent source. The results show a remarkable conformity in the two specimens.

	No. 1.	No. 2.	
Nickel =	9·44	10·17	
Cobalt =	3·82	3·85	
Iron =	11·85	12·92	
Sulphur =	4·78	5·62	
Arsenic =	70·11	67·44	(from the loss).
	100·00	100·00	

The analysis offered evidence of the presence of another substance, belonging apparently to the same group with molybdenum, but its minute quantity, and the limited supply of material at the disposal of the analyst, prevented its separate determination.

It would appear, from these analyses (which confirm others, that have been made in the Yale laboratory), that the ore in question is rather a nickel than a cobalt ore.]

96. Fleming, W. W., *Metallurgical Works at Camden, New Jersey.*—Manufacturer.

Specimens of nickel and cobalt ores.

Oxyd of cobalt; metallic cobalt; protoxyd of nickel; metallic nickel; sesquioxyd of nickel; sulphate of copper; large slab of German-silver; ditto, containing 20 per cent. of nickel.

[Nickel has not yet been announced as found in any considerable quantity in the United States. As before mentioned (No.), it is associated with the chromic

iron of Lancaster county, in Pennsylvania, giving origin to the beautiful *emerald nickel*, which is found, as a transparent emerald-green coating, in seams in the chromic iron. It is found, also, as cloanthite or chathamite, at Chatham, Connecticut (No. 86), and in more considerable quantity than the cobalt ores, for which the mine is worked. In Mine la Motte, it is associated with the *black oxyd* of cobalt, and also exists as copper nickel. *Millerite*, or capillary pyrites, which is a sulphuret of nickel, with about sixty per cent. of nickel, is found among the iron ores of Antwerp, in northern New York, and in Pennsylvania. A limonite from Lake Superior, with nickel, has already been noticed (No.), and a similar limonite was brought, by Mr. Blake, from Lincoln county, in North Carolina. Nickel is one of the two or three metals that obey the attractive force of the magnet. Its hardness, white color, freedom from oxydation, and the similar properties which it gives to its alloys, render it a very desirable metal, and it is to be hoped that it will soon be found in profitable quantity in the United States.]

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97. Jackson, Dr. Charles T., *Boston, Massachusetts.*—Proprietor.

1. Specimens of cassiterite (tin ore), Jackson, New Hampshire.
2. Specimen of ore of arsenic, which accompanies the tin ore (mispickel).
3. Specimen of porphyritic trap rock, which occurs near the cassiterite.
4. Specimens of metallic tin made from the ore, and of brass made from the tin, with Lake Superior native copper.
5. Specimens of native copper and silver, from Eagle River, Lake Superior.
6. Crystals of apatite, Hurdstown, New Jersey.
7. Franklinite, from New Jersey.
8. Red zinc ore, from New Jersey.

[The only ore of tin, known in the United States, is the oxyd. It has been found in small quantities in many of the gold mines of the Southern States, and also in rocks in Chesterfield and Goshen, in Massachusetts. In all places wherever it has been found in the United States, it is associated with the newer metamorphic rocks.

Dr. Charles T. Jackson (the exhibitor) made known a locality of oxyd of tin, discovered by himself, in 1840, while engaged in the geological exploration of New Hampshire. These veins (there are *five*) are in the town of Jackson, near the White Mountains. They occur in compact mica slate-rock, on a hill of considerable elevation, upon the estate of Mr. William Eastman.

One of the veins runs nearly parallel with the strata, or nearly north and south; the tin ore in it is wholly crystallized, and occurs in crystals not larger than a grain of wheat. The vein is eight inches wide on the surface, and is made up of copper pyrites, mispickel, and fluor-spar, through which the oxyd of tin is disseminated. This vein is intersected by a dike of brown trap rock. A trial lot of this ore yielded thirty to forty per cent. of metallic tin. This vein is crossed by a second east and west vein (north, 80° west; south, 80° east). It is included in a granite vein, which intersects the mica slate strata. The tin ore in this vein is also in crystals, but much smaller than the last; not generally larger than a pin's head, and closely implanted in the gangue of quartz and arsenical pyrites.

The three other veins are very small ($\frac{1}{4}$ to $\frac{1}{2}$ of an inch), and are wholly filled with the compact tin ore, without any foreign admixture. This compact ore yielded on assay, seventy-three per cent. of metallic tin. The rock, near the vein, yields from two to ten per cent. of tin. Vein No. 2 was first observed, by Professor Forest Shepherd, in 1851. These are the only regular veins of tin ore as yet observed in the United States, and well deserve exploration. We understand that they have fallen into the hands of a party who will give them a thorough exploration.]

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98. Sedgwick, Theodore, *New York City.*

Two large masses of cinnabar, from New Almaden, California.

[The only known locality of this ore, in the United States, is this one in California. Its geological position is, beyond doubt, in the newer metamorphic rocks; of what precise age remains to be determined, but probably of the same age with the gold-bearing rocks. The New Almaden quicksilver mines appear to have been known for a very long period, to the aboriginal inhabitants, as a "cave of red earth," from which they obtained paint for their bodies. It became known to Europeans as a quicksilver mine about 1844. The first scientific notice which we find of it, in any American journal, is in the "American Journal of Science," &c., vol. vi., p. 270 (2d series), from the pen of Mr. C. S. Lyman, who visited it in 1848. The ore is a compact cinnabar, very bright and brilliant in the fresh fracture, and yielding from fifty to sixty per cent. of mercury, according to the amount of gangue (which is quartz and carbonate of lime). Mr. William P. Blake has very lately written an account of this mine (February 14, 1854), which is published in the "American Journal of Science," vol. xvii., No. 51, p. 438. The mine is midway between San Francisco and Monterey, a few miles from the coast, and in one of the ridges of the Sierra Azul mountains. The ore occurs in strata of sedimentary origin, consisting of alternating beds of argillaceous shales and layers of flint, which are highly tilted, and much flexed. The mine and reduction furnaces are under the general superintendence of Captain H. W. Halleck, formerly United States Topographical Engineer. An adit level has been run in for 900 feet, cutting the old workings about 200 feet below the former entrance. This adit is 10′ × 10′, and well timbered. All the ore and refuse is brought out on a rail-track, four feet wide, laid down in this main adit. The passages of the mine are very irregular, and much contorted, owing to the ore being followed wherever it could be found. No regular system of adits and lifts seems to have been followed. Transit from one level to another is effected by rude steps, cut in the rock, often replaced by notched poles, in place of ladders. The opinion prevails, among the miners and others, that the deposit is a pocket, or "horse," and not a regular bed, or lead. The great width and number of the beds has confounded all ideas of extension, or prolongation in any particular direction, and led to the belief that the bed is "as broad as it is long." The character of the deposit may not be that of a *true vein*, but that it has a determinate extension and direction, Mr. Blake has no doubt, and has, indeed, satisfactory evidence of the fact. The ore is divided into lenticular masses, by intercalations of rock of variable thickness, and these are often filled with seams and veins of the sulphuret. Numerous veins of carbonate of lime traverse the rock, in various directions, sometimes crystallized, and containing small quantities of bitumen in cavities, and implanted in globules among the crystals. Sulphurets of iron and copper, with arsenical pyrites, are also associated in small quantity. Gold is said to have been frequently found in small quantities. Crystals of cinnabar have not been found; the ore is all massive, and presents various shades of color, and fresh fractures possess great brilliancy and beauty. The mine is very dry, and no decompositions have occurred, to give rise to mercurial salts. The mining is carried on by Mexicans and Yaqui Indians—the same tribe who are engaged in the pearl fishery on the Gulf of California; they are excellent miners, and endure hard work well. It is very interesting to behold such stores of rich ore as this mine displays on all sides. The furnaces for reduction are upon a new plan. All the vaporized sulphur is converted into sulphurous acid, by the judicious admission of air, thus separating it from the mercurial vapor, and preventing a recombination in the condensing chambers. The ore is not crushed, nor mingled with lime. The details of this new method of reduction are not given by our correspondent, nor have we any recent statistics of the product of the mine. Mr. P. S. Hart ("American Journal of Science," vol. xvi. [II.], No. 46, p. 137) states, under date of November, 1852, that the mine was then yielding about 75,000 pounds a month, or 1,000 flasks, of seventy-five pounds each.

A new locality of mercury is noticed by Mr. Blake, as just discovered in Sonora, of which he had seen specimens, the sulphuret mingled with running mercury.

The discovery of abundant supplies of quicksilver, on the Pacific coast, must be regarded as a matter of material importance to the whole world. Now that the great increase in the supply of gold has rendered the ratio between that metal and silver of an uncertain value, it is very desirable that the silver mines of South America and Mexico should be brought into a more active state of productiveness. It is well known that the scarcity and high price of mercury has forced the abandonment of many silver mines, which can now, beyond doubt, be worked again to advantage.]

4.—*Ores of the Precious Metals.*

99. Ward, Brothers & Co., 16 *Exchange Place, New York.*

Native silver with blende and calcite from Prince's Vein, Lake Superior; native silver from Phœnix Mine, Lake Superior; black oxyd of manganese from Copper Harbor; ingots of silver; nodules of native silver with copper; agates from the beach at Kewaiwóna Point and Manitou Island, Lake Superior.

A large mass of native copper from the Toltec Mine, Lake Superior, weighing 1610 pounds; specimens of native silver from Prince's Bay, Lake Superior; bars and plates of silver.

[Among the phenomena presented by the Lake Superior native copper formations, which throw mystery around their origin, is the manner in which nodules of metallic silver occur in them, examples of which are exhibited in this collection. These nodules of silver are frequently found inclosed within, and wholly surrounded by the solid mass of copper, and are sometimes so abundant that a polished surface of the copper will appear mottled all over with large spots of silver. The strangest part of the matter is, that upon chemical examination, the silver is found to be wholly free from copper, and the copper also, even when in immediate proximity with the silver, equally free from all alloy of the latter, as first noticed by Professor B. Silliman, Jr.

The rocks of the United States have thus far yielded comparatively little silver. Native silver has been found in numerous places, of which the most remarkable example is before us. Masses of several pounds weight, of nearly pure native silver have been furnished by the Lake Superior Mines. On the north shore of Lake Superior a silver mine has lately been wrought to some extent. Silver is also very commonly associated with gold in the United States, and often in considerable proportions. The Washington Mine in Davidson county, North Carolina (No. 60), which was began as a gold mine, yielded for some time a large amount of argentiferous galena. The yield of this mine in silver, prior to 1845, had been $30,000. Other similar mines have been more recently reported in the same district of country. The only portion of the United States territory, so far as our present knowledge extends, which promises to yield silver in any considerable and reliable quantity, is that part recently acquired from Mexico. In some of the very productive mines on the borders of the United States and Mexico, the rich silver-lead ores occur at the junction of igneous or highly metamorphic rocks, with the carboniferous limestone, which is partially or completely crystalline and penetrated by the metalliferous veins.

Several mines of argentiferous galena, in the newer metamorphic rocks of the Northern States, have already been noticed. (Nos. 79, 80, etc.)

We have access to no authentic documents giving the total product of silver in Mexico. It must be very large, and still owing to the unsettled state of the country, and to the restrictions which a vexatious public policy on the part of the government throws about it, we have reason to believe that the total amount of silver raised is but a small part of the capacity of productiveness of the mines already known. The Mexican silver ores were fairly represented by the very interesting collections of Mr. Ehlers, No. 96.]

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100. Meeks, J. C.

A number of masses of virgin silver, from different localities in Mexico; from Morelo, Ures, and other places in Sonora; from Arizona, in calcite, &c.

101. FITCH, REV. DR., *New York City.*

Pyrargyrite (ruby silver ore), Alisos, Sinaloa, Mexico; native silver, in calcite, from mine of St. Peter Morilos, Chihuahua, Mexico; silver ores, copper pyrites, copper glance and pyrargyrite, from *Mina de la Descubridora.*

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102. EHLERS, JOHN, *Weehawken Heights, New Jersey.*

A large collection of cabinet specimens of silver and other ores from various Mexican mines.

A. From the Valenciana Mine, Guanajuato:—

1. Selbite (?) (carbonate of silver).
2. Native silver, with selbite.
3. Vein of selbite, with the wall rock.
4. Pyrargyrite (dark-red silver ore), crystallized, with pyrites and calcite.
5. Native silver, with selbite.
6. Argentiferous galena, with pyrites.
7. Pyrargyrite, with pyrites.

B. From the Marqui dè Rayas Mine, Guanajuato:—

8. Blende, pyrites and silver glance.
9. Pyrargyrite and pyrites.
10. Argentiferous galena and pyrites.
11. Silver glance.
12. Pyrargyrite and pyrites.
13. Argentiferous galena.
14. Pyrargyrite.
15. Selbite.(?)
16. Pyrargyrite.

C. From mine la Gamariña Guana cevi, Durango:—

17. Native silver, argentiferous galena and pyrites.
18. Native silver and pyrargyrite.
19. Native silver, selbite, pyrargyrite, and pyrites.
20. Argentiferous galena.
21. Argentiferous galena.(?)
22. Pyrargyrite.

D. From the Iron Mountain of Durango:—

23. Magnetite.

E. From the Palos Mine, Chihuahua:—

24. Auriferous and argentiferous erubescite, which contains 37 marks or 18¼ lbs. of silver, and 60 grains of gold in each 300 lbs.
25. Erubescite, with copper pyrites.
26. Carbonate and red oxyd of copper.
27. Copper pyrites.
28. Copper pyrites.
29. Erubescite.
30. Copper pyrites, with galena.
31. Azurite.
32. Copper pyrites, with gray copper.

F. From the Matapilas Mine, Chihuahua:—

33. Massive native silver.

G. From the Guadalacazar Mine, San Luis Potosi:—

34 and 35. Quicksilver.
36 and 37. Cinnabar.

H. From the Guadalupe Caloo Mine, New Mexico:—

38 and 39. Quicksilver ore (in this mine is found some native quicksilver).

I. From an unknown locality in Zacatecas:—

40 and 41. Wulfenite (molybdate of lead).(?)

J. From an unknown locality in Durango:—

42. Native silver, crystallized pyrargyrite, and quartz.
43. Bromic silver.
44. Native silver and selbite.
45. Selbite.
46. Native silver and calcite.
47. Selbite.(?)

K. From the San Borga Mine, Zacatecas:—

48. Native silver and selbite.
49 to 53. Native silver and argentiferous galena.
54. Argentiferous galena and pyrites.
55. Native silver and argentiferous galena.
56. Native silver, argentiferous galena, and zinc blende.
57. Pyrargyrite.
58. Argentiferous galena.
59. Zinc blende.

L. From the Collado Mine, Zacatecas:—

60. Native silver, argentiferous galena, and pyrites.
61. Native silver and argentiferous galena.
62. Native silver.
63. Selbite.
64. Quartz and native silver.
65. Pyrites and native silver.

M. From the Celestina Mine, Zacatecas:—

66. Native silver, with silver mineral of a green color.(?)
67. Native silver and amethystine quartz.
68. Native silver and quartz.
69. Argentiferous galena and native silver.
70. Native silver and pyrites.
71. Quartz and argentiferous galena.
72. Native silver and selbite.
73. Selbite.

N. From the Casa Blanca or Casa de Plata Mine, Fresnillo, Zacatecas:—

74. Native silver and calcite.
75. Native silver.
76. Native silver, quartz, and pyrites.
77. Native silver, calcite, and pyrites.
78. Native silver, with pyrites.
79. Native silver, green silver,(?) and pyrites.

O. From the Veta Grande Mine, Zacatecas:—

80. Native silver, galena, and pyrites.
81. Selbite.
82. Native silver and amethystine quartz.
83, 84, and 85. Native silver and quartz.
86. Native silver and selbite.
87. Native silver and galena. From the year 1828 to 1842 this mine produced $1,000,000 annually.

P. From la Luz Mine, Real di Catoree, San Luis di Potosi:—

88. Horn silver (chloride of silver).
89 and 90. Green silver.(?)
91. Native and green silver.
92. Native silver and selbite.
93 and 94. Native silver.
95. Native silver, quartz, and galena.
96. Native silver and selbite.
97. Native and green silver.
98 and 99. Native silver and argentiferous galena.
100. Green silver. (?)

[This mine is owned by the Gordoa family, has been very productive, and still yields plenty of good silver.]

Q. From the San Jose Mine, Real di Catorce, San Luis di Potosi:—

101. Copper pyrites.
102. Native silver and galena.
103. Green silver.(?)
104. Bromic silver.
105 and 106. Native silver.
107 to 110. Earthy silver ores.
111. Chloride and bromide of silver.

[The San Jose Mine is 1500 feet deep. It is now worked by an English Company with little or no success.]

R. From the Jesus Maria Mine, Durango:—

112 to 115. Native silver.
116 and 117. Earthy silver ores.

S. From the Boti Mine, Zacatecas:—

118. Native silver and galena.
119. Native silver and quartz.
120. Native silver and pyrites.
121. Crystallized iron pyrites.
122 and 123. Veinstone.

T. From the Guadalupe Calso Mine, New Mexico:—

124. Native silver and pyrites.
125. Native silver.
126. Native silver and galena.
127. Selbite.
128. Native silver and galena.
129, 130, and 131. Native silver.

[This mine was at one time worked by an English Company, who were forced, however, by attacks of the Indians and scarcity of provisions, to abandon the enterprise.]

U. From an unknown mine in Guanajuato:—

132. Native silver and selbite.
133. Crystallized selbite.(?)
134. Copper pyrites.
135. (?)
136. Native silver and selbite.
137. Native silver and rock.
138. Native silver and pyrargyrite.

V. From the Obscuro Mine, Sombrereto, Zacatecas:—

139. Zinc blende, galena, and native silver.
140. Pyrargyrite.
141 and 142. Selbite.
143. Native silver and pyrites.
144. Selbite.
145. Galena and native silver.
146. Pyrargyrite.
147. Native silver and selbite.
148. Native silver and pyrites.
149. Bromic silver.

W. From the Casa Blanca Mine, Fresnillo, Zacatecas:—

150. Horn silver.
151. Native silver and quartz.
152. Native silver.

X. From la Victoria Mine, Fresnillo, Zacatecas:—

153. Pyrargyrite.
154. Native silver.

155. Pyrargyrite.
156, 157, and 158. Native silver, the last with pyrites.

Y. From la Luz Mine, Guanajuato:—

159 to 162. Native silver, with quartz.
163. Native silver.
164. Crystal of quartz, containing a drop of water.

[This mine, *la Luz*, belongs to the family of the Count Perez Galoez and others, and produced in the years 1847 and 1848 about $50,000 per week, or $2,500,000 per annum. In 1851 it produced a net profit of $1,500,000.]

Z. From ——— Mine, Real di Catorce:—

165 and 166. Native silver.
167. Laminated native silver.
168. Laminated native silver, with pyrites.
169. A crystal of pyrargyrite.
170. Native silver.

AA. From the Conde de Regla Mine, Real del Monte:—

171. Horn silver.
172. Horn silver, with native silver.
173. Native silver.

174. Native silver in the form of wires or soft flexible fibers, some of which are of an extraordinary length, varying from three to fifteen and a half inches.

175. Thirty-five small specimens of various silver ores, including a specimen of native silver, in capillary fibers; a specimen of quartz, in which is a fiber of silver *encrusted with small quartz crystals* which have formed upon it; and a piece of native silver fiber of extraordinary thickness.

176 to 180. Specimens of silver ore, stamped and ground, ready for the process of amalgamation, from Zacatecas.

181. A vial containing a specimen of the amalgam.

182 to 184. Specimens of amalgam.

185. Piece of pure silver, obtained from the amalgam by expelling the quicksilver by means of heat.

186. Specimen of pure porous silver, showing the form in which the silver is left after expulsion of the quicksilver.

187 to 191. Specimens of small images, for toys, composed of pure silver, being moulded in the first place from the soft amalgam, and the quicksilver afterwards driven off by heat.

192. Mexican bridle reins, wrought out of silver-wire.

193. A piece of meteoric iron from Zacatecas, cut from a large piece which is said to have been brought by the natives of Northern Mexico from a great distance, as a present to the Spanish Governor of Zacatecas, at the time of the first exploration of that part of Mexico by the Spaniards. The original mass measured about five feet in length, eighteen to thirty inches in width, and nine to eighteen inches in thickness.

[The occurrence of native silver in slender and elongated filaments and arborescent forms, in connection with the sulphurets of iron and copper, has often been the subject of wonder and speculation. It was not easy to see how metallic silver could have been found or could exist in circumstances where iron and copper were sulphuretted. A recent observation in the laboratory has, however, furnished an explanation of this fact, as simple as it is probable. It has been observed, that when steam was passed over a mixture of the sulphurets of copper, iron, and silver, at a high temperature, the silver was reduced and assumed the same capillary and arborescent forms observed in the native silver of the mines, while the other metallic sulphurets were unaffected. It is not impossible that electro-dynamic currents may have deposited the silver in *some cases* from solution, but this method of accounting for the native silver of the mines is far less probable than the former one. In case of metallic copper (a metal so constantly presented in the form of its soluble sulphate by the operation of natural causes) we may, with much more evidence of truth, adopt the electrical origin. "This collection presents fine specimens of the ores of silver, native silver, &c., and deserves notice, as being obtained by the personal exertions of the exhibitor."—*Jury Report, Class I.*]

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103. Adams & Co., *New York City.*—Proprietors.

One hundred and seventy-seven specimens of California gold, principally from Mormon Island: Tuolumne, Yuba, Trinity, Mopelumne, Feather, American, Stanislaus, Shasta, Bear, Rogue's, De Shute's, Calaveras, Merced, and Sacramento Rivers; Jackson, Woods, Sullivan's, Kanaka, Dry, Humbug, Butte, Poor Man's, Deer, Rush, Wolf, Angel's, Agua Fria, Jacob's, Weber, Irish, Shingle, Granite and Slate Creeks, Calaveras and Mariposa counties.

Australia gold from Bathurst, Balaarat, Owen's, Kangaroo, Bendigo, and McVickar's Diggings.

Of the value of about $85,000. Five ingots, the largest of which weighed about 563 ounces, of a value of $11,500; the ingots collectively weighed 1414¼ ounces, valued at $28,997.50.

Specimens of cinnabar and auriferous quartz from California.

"This collection presents specimens of remarkable interest, and deserves the highest commendation."—*Jury Report, Class I.*

[*The gold of California* was magnificently represented at the Crystal Palace through Messrs. Adams & Co., who deposited specimens of virgin gold and ingots to the value of $85,000. The display was not simply rich in external beauty and intrinsic value, but historically and geologically interesting, showing, by the worn surfaces, evidence of the alluvial action to which the region had long been subjected, and by the sizes of the masses, the wonderful profusion of gold that must still exist in the rocks.

California is remarkable for the simplicity of its great geological features, and the vast extent of its interior alluvial region: and as the gold has been obtained mostly from alluvial deposits, these facts account in some degree for the wide diffusion of the precious metal. Instead of a central peak or clustered ridges, a single range of mountains stretches along the whole length of the country, retaining throughout a general uniformity of direction. This range, the now well-known Sierra Nevada, runs nearly parallel with the coast, and extends beyond the Shasty Peak on the north. The Cascade Range of Oregon is properly the northern continuation, but the two are not continuous lines; the Oregon range gradually dies out in northern California, while the Sierra Nevada is rising to its snowy altitude on a meridian a little farther to the east, exemplifying a common feature in the constituent parts of mountain chains—their interrupted continuity with overlapping ends—rather than a direct lineal course. The former is more volcanic in character, including in its line some of the most majestic volcanic summits in the world; while the latter has a greater average height, and consists very largely of granitic and schistose rocks. Where crossed by Fremont, in latitude 38° 44′, the Sierra was 9338 feet high, which is 2000 feet above the South Pass of the Rocky Mountains, and points in the range near by rose above them several thousand feet. The pass at the head of Salmon Trout River, in latitude 39° 17′, is 7200 feet. The same mountains continued south constitute the range of heights forming the California Peninsula.

Alongside of the Sierra Nevada lies the great alluvial region alluded to, the Sacramento Plain. The interior of California is often called a *valley*, inclosed by the Sierra on the east, and the coast hills or mountains on the west. But this gives no adequate idea of the country. It is rather an open prairie, ten to fifty miles in width, lying between the lower slopes of the mountains, and gradually rising east and west, but more especially on the east, into the mountain acclivities. Through this vast prairie, 450 miles long, there flows from the north the Sacramento, and from the south the Joaquin, which meet half way along the plain, and turn their united waters into the Bay of San Francisco. These rivers are but small streams compared with the extent of waters that have occupied the region; for the whole soil of the plain, from one side to the other, has been distributed by flowing waters—the whole is a single alluvial or diluvial area, through which one system of operations has acted. The surface consists partly of the present river flats, many miles wide, and partly of an upper terrace of gravel, sand, or clay, which reaches back to the hills. This terrace, after a first steep rise of seventy feet, increases gradually in height to two hundred or three hundred feet.

Many a tributary is received by the Sacramento and the Joaquin from the mountains around. On the north is Destruction River, which rises near the Shasty Peak, and after flowing as a torrent among the mountains, finally emerges into the Sacramento Plains. More to the east are Yuba, Bear, Feather Rivers, and others too well known to require mention in this place. They all form, together with the great trunks, one single water system. And they are not only so now, but they have been so ever since the terraced gravel and sand of the country were deposited. Such is the remarkable unity and uniformity of the interior of the State of California.

The upper terrace, viewed from the lower flats of the river, presents a nearly even height to the eye; but once upon it, and all its apparent evenness is often lost. It is cut through by numerous deep channels or valleys, which are dry except in the rainy seasons, and in many parts the country is reduced to groups of rounded hills, 200 feet or so in height, amid which only an experienced eye would detect the remains of the old terrace. The material is not consolidated, and the rains therefore find it easy work to gully out the surface. This broken character increases towards the mountains, where the larger ravines, that cut through the gravel region, are found to be a continuation of the valleys and gorges of the mountains.

In addition to this uniformity in physical features, there is a similarity throughout in geological structure. In the Sierra Nevada there are some granitic peaks and ridges, but to a large extent the rocks are more or less slaty, being talcose, chloritic, and argillaceous slates; the same beds which, the world over, most abound in gold. They are intersected often by veins of quartz, which in some parts are very abundant, another peculiar feature of a gold region; for gold, when *in place*, is mostly confined to quartz veins, or the rock adjoining such veins. Pebbles and rounded stones from these veins and the silicious slates accompanying are profusely strewed over the surface of the upper terrace of the Sacramento. Talcose slates exist also on the north shores of the Gulf of San Francisco, but there are no quartz veins.

Besides the quartz, and the slate, and granite rocks alluded to, there are also some extinct volcanic summits; and, moreover, numerous basaltic dikes intersect the hills. But these are only a subordinate feature of the Sierra. One extinct volcano, the Sacramento Bute, rises out of the Sacramento Plains like an island from the sea. But it was long since extinct, and it has been reduced by degradation or the shattering forces now dormant beneath, to a mere mass of ridges and peaks, within an inclosure formed of what once was its lower slopes.

The distribution of gold over the California region, through its gravel beds and soil, is owing, beyond doubt, to the former wear and tear, by aqueous causes, of the gold-bearing rocks. We cannot say that existing causes are now producing the results as rapidly as in former ages, still the same kind of causes are at work. Torrents in the mountains, especially when fed by the rains, are tearing rocks from their places, gullying out the hills, and deepening the gorges, and all the surfaces of the declivities are subjected at times to the action of running water. Gradual decomposition, through atmospheric changes, is also effecting results slowly but surely. By these causes the softer shales are removed and the quartz veins are left unsupported, and these in their turn give way. The action of freezing water is superadded in some places during the colder season. The quartz of the veins is often much fissured or cellular, and readily yields under such agencies. It generally contains iron pyrites, and as this mineral readily decomposes when moisture is present, the means of the destruction of the quartz frequently resides within itself. The quartz, where exposed, is commonly cellular because of this loss of the pyrites, or of some allied mineral, by decomposition.

Another cause of the destruction of the rock and vein depends on the very nature

of a vein. It is a wall of rock intersecting other beds, usually at some oblique angle. Consequently the percolating waters, which penetrate through the most solid strata, tend to accumulate and flow or trickle along with more or less freeness by the side of the vein, especially its upper side; the result is, that the rock of the wall becomes softened or decomposed, and the destruction of both rock and vein from subsequent changes is hastened.

By some or all of these causes the gold-bearing rocks have been worn down, and their ruins have been strewed throughout the Sacramento region. What greater force the waters may have had in former times from their greater quantity, or whether glaciers may not have aided in the degradation of the mountains, we cannot say. The very large extent of the upper terrace of the Sacramento Plains proves the action of water to an extent vastly beyond any thing now seen.

While such processes of wear were at work, the water flowing in torrents to the valleys were conveying thither the gold. By this water-action the fragments and soil formed is subjected to a system of washing on a majestic scale, and the scattered results, proceeding from the process of grinding carried on over the hills, are gathered together. As the gold is heavy, sixteen to eighteen times as heavy as water, it requires the most rapid waters to transport it, except it be in very fine grains; and even in this condition it sinks, unless the current of the stream is strong. Hence it is that the gold is found along the gorges and valleys of the lower parts of the mountains; not too high up, where the rocks are more likely to be granitic, nor too low, where only the sands and pebbles are transported, the gold having been left behind. The region of gold-bearing slates averages about ten miles in width on the eastern slopes of the Sierra, from its southern limit in the Mariposa district to the Shasty and Klamath region.

The finest grains, to some extent, must have reached the Sacramento, and been scattered far and wide. There have been workings in the tributaries of the Sacramento, not far above their mouths; and gold has been reported as occurring in the soil of San Francisco itself.

The smaller runs of water about the upper declivities of the region, and any gullies wherever water may have been rapidly carried along, promise generally some returns to the miner. The slopes, wherever a crest of rock or a projecting wall served as a barrier to keep part of the gravel and its contents from pouring down, under the action of floods from the rains, into the main valleys, are apt to contain much gold, laid away in cavities or basins; such are the "pockets" of gold. And similar pockets, often rich in the yellow nuggets, occur along the beds of streams, where ledges of rocks have served to bank up the waters, or stay their course, or turn them off in eddies.

The gold is also distributed, more or less abundantly, in the gravel banks, either side of the streams, or the alluvial beds that occupy the valleys. In these cases, it is mainly confined to such layers as were formed by waters running with considerable velocity, as only such could transport and distribute the gold.

Some writers have ignorantly attributed the diffusion of the gold in California to volcanic action, and pointed to craters in the mountains that were supposed to have been active in gold-making. But this is contrary to science and observation. The volcanoes have had other work to perform, and have produced no effect on the distribution of the gold.

The gold of California has been discovered in the rocks, as well as in alluvial deposits, and the veins are described as remarkably productive, especially those of the Mariposa and Sonora regions. They have not yet been worked, however, with much profit. Gold never forms a continuous solid vein, like copper ores. It is distributed in thin plates or irregular masses, strings, leaves, or scales, and only in an interrupted manner where most abundant. Generally, the grains are hardly visible points, distributed through the quartz, and only at long intervals pieces of some size are met with. The process of grinding mountains to powder, has been going on, under the operations of nature, and the result is seen in a gold region like that of the Sacramento Valley. But man, with his best aids, can make the mountains crumble but slowly. The quartz, which toward the surface is cellular, below, after sinking one or two hundred yards, becomes solid and compact, as no decomposition has been in progress; and consequently, the grinding becomes more difficult as the shaft sinks. The gold is also distributed through the pyrites of the vein, which nature extracts through the slow decomposition of this sulphuret, but man worries over almost in vain. For these reasons, the working of veins of gold is profitable only when they are of extraordinary richness.

The discovery of gold has increased the annual yield of the mines of the United States, from less than half a million of dollars, to sixty millions. The whole amount estimated to have been taken from the mines, from the opening of them, in 1849, to January, 1854, is about 250 millions of dollars. It is stated, that there were received, at the port of New York alone, in 1852, near 49 millions of dollars. Nearly one-third of the gold received from the mines of the world, in 1852, came from California.

The gold region of California affords the same associated minerals as those of other countries. Grains of platinum and iridium, or iridosmine, are, to some extent, found; and the latter metal is rather abundant, affording supplies for the manufacture of the points of gold pens. It is separated in considerable quantities, in the working of the gold at the United States Mint, at Philadelphia. Magnetic iron, titanic iron, chromic iron, zircon, garnet, and rutile, occur in the sands of the region; diamonds have been reported, but the discovery needs confirmation. The mistake of a zircon for a diamond, is quite possible with one not acquainted with the former mineral.

The gold of the United States is entirely restricted to the newer metamorphic rocks, in its original geological associations. The range of this formation has been already indicated (Introduction, page 00). Certain portions of this, confined to a comparatively narrow belt, carry gold, throughout their entire extent, from Canada to Alabama, on the Atlantic side of the continent, and through at least an equal latitude on the Pacific side.* Beginning with the north-eastern part of the United States, gold was exhibited from Madrid, Franklin county, Maine (No. 112); gold in quartz, from the rock, in place, Bridgewater, New Hampshire (No. 113); gold in magnetite, from Maryland (No. 117); gold with garnets, Buckingham county, Virginia; native gold, Stafford and Goochland counties, Virginia, (No. 114); auriferous quartz, from Rowan, Mecklenberg, Lincoln, and Burke counties, in North Carolina (No. 115); gold, from Davidson county, North Carolina; gold ores, from Union and Montgomery counties; from Charlotte; and auriferous pyrites, from Rowan county, North Carolina (No. 155). From South Carolina, gold, and auriferous quartz, and sheets, were shown from Oakland Grove, in Edgefield District (No. 116); native gold was also shown from Georgia. Beside the fine Californian collection of Adams & Co., there were numerous other exhibitors from that State; and from a single locality in Oregon (No. 111).]

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104. Butler, Mrs. M., *New York.*

Auriferous quartz, from Union Mountain, Grass Valley, California; quartz crystals, from the same locality; specimens of gold in quartz, from Carson's Creek; crystallized gold, from same locality; specimens of crystallized gold, presenting apparently a fibrous appearance.

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105. ——— ———

Specimens of gold sand and auriferous disintegrated rock, Yuba River, California. Gold dust, with magnetic sand, after washing, very rich, from Bear Valley, California.

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106. Stearns & Jackson, *New York City.*—Proprietors.

Crystallized gold in quartz, from the Volcano Quartz Mining Company's location, El Dorado county, California.

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107. Bekhart, F., *New York City.*

Specimens of native gold, from Sutter's Mills, El Dorado county, California.

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108. Perry, John, Jr., *San Francisco.*

Crystallized gold with quartz, from Mariposa county, California, weighing 11¼ ounces.

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109. Arnold, L. M., *Poughkeepsie, New York.*

Crystallized native gold, from Yuba River, California.

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110. May, Julius, *San Francisco.*

Specimen of gold quartz, containing 97 per cent. of gold, and weighing more than 85 ounces, from California. [This was a fine illustration of a worn boulder of gold.]

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111. Burns, Hugh, *Oregon City, Oregon.*

Flat nugget of native gold, beautifully crystallized in arborescent forms, from Rogue River valley, Oregon.

[This was the only specimen of gold sent from Oregon, and was remarkable, not so much for size as for the beauty of its crystalline lines and plates, formed by the planes of the regular octahedron.]

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112. Lucas, Dr. H. S.

Native gold, from Madrid, Franklin county, Maine.

[This is the most northern occurrence of gold in the Eastern United States, and is interesting as marking the limits of what, in a geological sense, may be regarded as the northern range of the great auriferous zone of the newer metamorphic rocks. Gold has also been found, in masses of considerable magnitude, in the valley of the Chaudière River, in Canada, but none of the washings in New England or Canada hold out any promise of valuable returns for labor.]

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113. Hubbard, Professor O. P., *Hanover, New Hampshire.*—Proprietor.

Specimens of the gold and associated minerals lately found at Bridgewater, Vermont, viz.:—

1. Auriferous quartz, with native gold, from the veins in situ.
2. Galena (auriferous?) in the same vein.
3. Talcose slate, in which the auriferous quartz veins of Bridgewater occur.

[We are informed that these auriferous quartz veins are not likely to prove of economical value; but they are all interesting, as furnishing the only example yet observed in New England of the gold *in situ.*]

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114. Mitchell, W. M., *Fredericksburg, Virginia.*

Native gold with tetradymite, from Monroe Mine, Stafford county, Virginia.

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115. Allen, Ethan A., Jr., *New York City.*

Auriferous pyrites, from a mine at Gold Hill, Rowan county, North Carolina, which has yielded on an average, for the last seven years, $200,000 worth of gold annually.

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116. Dorn, William B., *Oakland Grove, Edgefield District, South Carolina.*—Producer.

Specimens of native gold, from a mine belonging to the exhibitor, and which has produced during the last year, with the labor of eight or ten men, $250,000 worth of gold.

* Native gold has been found in small quantities in the drift of central Ohio and Indiana, which is far removed from any metamorphic belt. Some other localities in the United States have furnished gold, beyond those mentioned, but in minute quantities.

["The Jury regard this collection as worthy of HONORABLE MENTION, since it presents an exhibition of the results of the working of a gold vein by the exhibitor." —*Jury Report, Class I.*]

117. THE PERSEVERANCE MINING COMPANY.—Producers. (Agent, T. TYSON, *Baltimore, Maryland.*)

Gold ores, from the Russel Mines, Montgomery county, North Carolina, worked by this Company.

[These mines, like those of Dorn, and of Goldhill, are represented to be in talcose slates, the gold-bearing portion being in seams parallel to the other slates, which are nearly vertical, with a north-east and south-west bend. The auriferous rocks occupy the ridges of four or five low hills, within a fourth of a mile of each other, and have been opened rather in the mode of quarries than as mines, the openings being free to the light of day.]

118. GREGORIE, CHARLES, *Fredericktон, Missouri.*

Magnetic sand, containing gold, found mixed with clay in St. Francis' River, Madison county, Missouri. Has been washed to separate the clay.

119. PEYROT, A., *New York City.*—Proprietor.

Specimens of crude platinum, platinum ware, &c., including crude platinum from Central America, French and English platinum plate, French and English platinum wire, of various degrees of fineness, very fine platinum wire wound upon a spool, platinum crucibles of various sizes, thin foil for Grove's batteries, thick French platinum plate, and palladium plate.

5.—*Minerals useful in Architecture.*

(Marbles, Sandstones, Slates, &c.)

120. SELDEN, E. D., *New Haven, Connecticut.*

Very beautiful white statuary marble, from Brandon, Vermont, polished and rough specimens.

121. PARKER, HOLLY & Co., *East Dorsett, Vermont.*—Producers.

Statuary marble, from East Dorsett.

122. ALLEN, ADAMS & Co., *Fairhaven, Rutland County, Vermont.*—Producers.

Crystalline granular white marble, two large blocks, from a quarry belonging to the exhibitors, in West Rutland, which produces about 30,000 cubic feet annually. It is used for statuary, for monuments, furniture, &c. This quarry has been worked for four years.

[*Statuary marble* of good quality has been found at several localities in the United States, all of which occur in the newer metamorphic rocks.

In many cases, it has proved difficult to obtain blocks of suitable dimensions, free from cloudiness or fissures, while the liability to the latter render many blocks, of excellent color and texture, uncertain in working. The finest statuary marble which has yet been obtained, in large blocks, has proved too friable, and does not possess sufficient tenacity to allow of working up to the required degree of sharpness. The best statuary marble in the country is obtained from the State of Vermont.

Common marble, for ordinary building and architectural purposes, as well as for the coarser works of art, is abundant in the United States. The whole range of the newer metamorphic rocks, from northern Vermont, at least as far as Maryland, afford abundant supplies of white granular limestone. The character varies from finely granular to coarsely crystalline, and from a compact close-grained mass to a friable crystalline rock. In color, it presents all varieties, from pure white to light and deeply clouded.

These marbles all result from the metamorphism of lower silurian limestones; and, in many of their localities, the same variations in the successive beds are still perceptible, as when in their unaltered condition.

Along the western slope of the Green Mountain Range, the principal localities are Brandon, Dorsett, Pittsford, Rutland, Middlebury, Fairhaven, and Sudbury, Vermont. The principal quarries in Massachusetts are at West Stockbridge, Egremont, Great Barrington, Lanesborough, New Ashford, Sheffield, and New Marlborough.

In New York, marble is quarried in large quantities at Sing Sing, and, to some extent, also, at Dover, in Dutchess county. The range of granular limestones extends through Columbia, Dutchess, and Putnam counties; and marble quarries may be opened at frequent intervals along the whole extent. In the adjoining counties of Connecticut, the same granular limestones occur abundantly, but they have nowhere been quarried to the same extent as in Massachusetts and Vermont.

In the same range of limestones, marble has been quarried to some extent in New Jersey; a few miles west of Philadelphia, in Pennsylvania; and near Hagerstown, Maryland.

The marble quarries in Rhode Island, eastern Massachusetts, and Maine, from some of which very fine marble has been obtained, belong to metamorphic limestones of more recent date. These quarries, though furnishing a considerable quantity of marble, are not wrought to nearly the extent of those before described.

The value of the marble sent out from Berkshire county, Massachusetts, was estimated by Professor Hitchcock, in his Geological Report of that State, in 1839, to be $200,000. It is doubtless, at the present time, much beyond half a million of dollars annually.]

123. GRISCOM, WILLIAM M., *Philadelphia, Pennsylvania.*—Producer.

Marble from Texas, Baltimore county, Maryland.

124. MCPHERSON, WILLIAM, *St. Louis, Missouri.*—Producer.

Marble from quarry in Jefferson county, Missouri.

125. ——— ———

Specimens of white and variegated fine-grained marbles, from Talladega county, Alabama.

126. BUDLONG & STOUGHTON, *New York City.*—Producers.

Ornamental marble from Chazy, Clinton county, New York.

[*Encrinal*, or *bird's-eye limestone* (*Official Catalogue*, No. 51).—The specimen exhibited in the collection is from the Chazy limestone. The bed is a compact crinoidal limestone, the fragments of columns and joints of crinoids being of a bright pink, and the other organisms of a darker color, which on the gray ground give a beautiful variety. A similar limestone, susceptible of receiving a polish, occurs in the lower bed of the Niagara limestone, at Lockport; also at Becraft's Mountain, near Hudson; where the organic remains are nearly similar to the specimens from the Chazy.*

The Onondaga limestone, in the neighborhood of Le Roy and Batavia, New York, affords a similar marble, which receives a fine polish, and presents a much greater variety of organic remains than either of the others.

Almost all the limestone formations in the United States contain beds of greater or less thickness, and wide extent, which furnish encrinal marble; but it is only in a few localities that the variety of the color in the organic exuviæ is sufficiently brilliant or contrasted to make them desirable for ornamental purposes.

The marble, formerly known as "bird's-eye" marble in New York, is a limestone penetrated by numerous stems of a plant-like body, which is embedded in the position in which it grew, and the surface of the layers, when polished, presents sections of the stems; it possesses no great beauty or variety.

The encrinal limestone of the Niagara group has proved a very excellent and durable building-stone, and it has been extensively used for the massive and beautiful locks and piers on the Erie Canal, at Lockport, and as a building-stone in Buffalo, Lockport, and Rochester; and has also been transported from Lockport to Chicago, for the construction of a beautiful city-hall and court-house at that place.

The encrinal layers of the Onondaga limestone have been also largely used for locks on the Erie Canal, and for building purposes in many of the cities and towns in central and western New York. Excellent building materials are also obtained from the limestone ranges of the northern and central part of Ohio, and extending into Indiana and Kentucky, though generally in less heavy beds than in New York.

Very fine and durable building-stones have likewise been obtained from the lower silurian limestones, in the same association as the black marbles before described.

Limestone fit for building purposes, and sometimes of an ornamental character, may be found throughout the entire extent of the several limestone groups described.

When we extend our inquiries to the West and South-west, beyond the limits of the silurian and devonian limestones, and within the carboniferous districts, we find the place of the former supplied by numerous varieties of the carboniferous limestone. Many of these are compact dun or drab-colored layers, gray and sub-crystalline beds, compact and fine-grained oolitic beds, &c., all of which are quite sufficient for ordinary architectural objects, and some of them receive a fine polish.

Conglomerates and Breccia Marbles.

The "Potomac and breccia marble."—This rock, of the newer red sandstone series, is in some places sufficiently calcareous to be cut and polished as marble. The Potomac marble, of which the columns of the Hall of Representatives at Washington are made, is of this rock. The material is beautiful, but the working is expensive, and there are other objections to its general use.

Black marble, of excellent quality, is obtained at Glens Falls, New York, and at Swanton, Shoreham, and Isle la Motte, Vermont. It may also be obtained at numerous other localities along the same range of limestones. The marble of the localities named is a stratified unaltered limestone, of the lower silurian age, being, in part or entirely, the Chary limestone of the New York Geological Reports. A fine block of this marble, with the arms of the State of New York beautifully sculptured upon it, by Mr. Palmer, of Albany, has been sent to the Washington monument.]

"The Jury on Class I. award a prize-medal to the exhibitors 123, as being the first to bring forward this material, in its application to useful and ornamental purposes."—(Jury Report MSS.)

127. HOLMES, DR. R. S., *St. Louis, Missouri.*

Marbles and limestones from Missouri, comprising the following:—

Marble from a quarry at East Kirkwood, about twelve miles from St. Louis.

Marble full of organic remains, capable of taking a very high polish, and lying immediately beneath the former.

A very hard and durable stone, of great local reputation for hearths, &c., having an extraordinary power of enduring the action of heat.

Marble from a quarry in Jefferson county, twenty-five miles south of St. Louis, and about two miles from the Mississippi River, near the railroad from St. Louis to the Iron Mountains. It is beginning to be used as a building material in St. Louis.

Oolitic limestone, known under the denomination of "St. Genevieve marble," from a locality near the Mississippi River, in St. Genevieve county. It is a very extensive formation, obtained with great facility, and is used as a building-stone in St. Louis, and, to some extent, also in New Orleans.

128. COBB, HENRY, *St. Louis, Missouri.*

Marble containing fossils, from St. Louis county, about nine miles south-west of the city of St. Louis.

Coal, from mines three to eight miles west and south of St. Louis, which furnish a large portion of the coal used in St. Louis, both for manufacturing and domestic purposes.

* See Silliman's American Journal of Science, vol. vi., p. 371.

129. McJilton, James T., *St. Louis, Missouri.*

Polished specimen of variegated marble, from a bluff on the Mississippi, near St. Louis.

130. Dean, James E. P., *New York.*

Polished slab of verde antique, or serpentine marble, from Milford, Connecticut.

[*Serpentine marble,* or verde antique, occurs in numerous localities along a belt of formation which extends, from northern Vermont, through the western part of Massachusetts, Connecticut, a small portion of southern New York, New Jersey, Pennsylvania, and Maryland. It has been clearly shown by Mr. Logan, Geologist, of Canada, that this formation is metamorphic of a part of the Hudson River group, and, as is well known, accompanies, and depends for its existence upon the presence of chromic iron.

This marble occurs in beautiful varieties at Cavendish, Lowell, and Troy, Vermont; in Cheshire, Massachusetts; in Milford, Connecticut; and other localities along the line indicated, though it has been quarried in a few places only.

A verde antique marble, of different character, occurs at Port Henry, Essex county, New York, in Warren county, and in St. Lawrence county, in the same State; but these localities belong to a different geological formation, and are not accompanied by the chromate of iron.

The Connecticut quarries were opened as long ago as 1812, their beautiful products having been brought into notice, in 1811, by Professor B. Silliman.* They were discovered by Mr. Solomon Baldwin, then a student in Yale College. There are two quarries; one, two and a half miles west of New Haven, and one near the village of Milford, about nine miles from New Haven. From the latter was derived the specimen at the head of this note. Both the true verde antique marble and common serpentine marble are found here. The latter variety prevails at New Haven, the former at Milford. It is a matter of surprise that so beautiful a material should have found comparatively little favor, especially, considering the high esteem in which the verde antique is held in Europe.]

131. Pond, Hiram, *South Malden, Massachusetts,* and *New York City.*

Specimen of serpentine from Deer Island, (in the form of a model of the Bunker Hill monument.)

132. North River Mining Company. (Agents, Anthony, Lawrence & Co., *New York*) —Producers.

Specimens of marble composed of serpentine and dolomite; white and flesh-colored marbles; from Sudbury, Vermont.

133. ——— ——— *New York.*

Drab-colored and brown sandstone from the Potsdam sandstone, Malone, Franklin county, New York.

["The Jury of Class I. make the award of a Prize Medal to the exhibitor, as having brought before the public and used this very durable rock as a building stone. Though long known and used, and fully appreciated in the immediate vicinity of its occurrence, in many places, it has received no attention from the public generally. Building materials, though abundant and various in many parts of the country, have thus far been to a considerable extent overlooked; and, consequently, those who seek these materials for use, have little choice or variety.

"The Jury make this award as an expression of their appreciation of an attempt to introduce to public notice a valuable material of this kind."—*Manuscript Jury Report.*

The Potsdam sandstone is capable of furnishing immense quantities of a durable building stone, and of considerable variety of color. The prevailing tints of this stone are gray, light brown, and varying from this to brick red. It is well worthy of being introduced among architectural materials. The extensive range of the Potsdam sandstone from northern New York southwards through New Jersey, Pennsylvania, Maryland, and Virginia, will afford numerous localities favorable for transporting and working.

The gray sandstone of the Hudson River group, when fit for building purposes, has only a local development, and is therefore not likely to come into general use. It can be obtained in large quantities in Oswego and Lewis counties, New York.

The sandstones and grits of the Shawangunk mountain range afford massive and durable material for building purposes.

The Medina sandstone, in some parts of the formation, furnishes a good building material, the prevailing color of which is a brick red, sometimes variegated, and becoming dark on exposure. This rock is developed principally in the western counties of New York, along the Erie canal; and to an equal or greater extent in Pennsylvania; but the distance for transportation will prevent its introduction into the eastern cities.

The Oriskany sandstone breaks with an irregular fracture, and is not of much use except for rude structures.

Along the Ohio valley, and elsewhere in the west, the fine-grained or Waverly sandstone, of the age of the Chemung group, furnishes good freestone for building purposes.

Some of the coarser sandstones of the Catskill Mountain group, form good building materials; but have attracted little attention.

The sandstones of No. X. of the Pennsylvania Reports, the shale and sandstone formations below the coal, furnish heavy masses for coarse structures. This rock is seen in outliers upon the hills in some of the southern and south-western counties of New York, and is a useful material within the regions where it occurs.

The sandstone of the coal measures.

A coarse and conglomeratic freestone of the Tertiary period, has been extensively used for public edifices in Washington city. The Capitol, Patent Office, and others, have been constructed of this stone; but it has been found too porous and friable to resist the action of the weather, even in that mild climate.]

134. Middlesex Quarry Company, *Portland, Connecticut.*

Freestone dressed and undressed.

[Freestones for building, and to some extent for ornamental architecture, are derived chiefly from the sandstone of the Connecticut valley; and from the rock of the same age in the Hudson valley and New Jersey.

This extensive formation, from which building stone is transported to all the Atlantic cities, and which furnishes over ten times more than all the other sandstone formations together, was represented only in the single specimen cited above.]

Granite.—Although this valuable material abounds in the United States, it was unrepresented in the collection of the New York exhibition, partly for want of room, but more from the apathy of proprietors of quarries who failed to send ore specimens, though solicited to do so. A few remarks upon building materials may not, however, be out of place here.

[Under the head of Granite, are included not only granite proper, but also syenite and gneissic rocks, which, in ordinary language, fall under the term granite. Materials of this character may be sought successfully over the greater part of the area occupied by the older metamorphic rocks, and to some extent among the newer metamorphic formations.

Northern New York, the Highlands on the Hudson river, New Jersey, and Pennsylvania, afford numerous localities of granite rocks of good quality. In the New England States, building materials of this character are abundant; but at the present time they are furnished mostly for local use, with the exception of the localities along the coast. The Quincy granite has a wide reputation, and besides being used extensively in Boston and the vicinity, it is largely shipped, and particularly to New York. A considerable extent of country around Boston can furnish similar building stone.

The continuation of the same formation southward affords numerous localities; and granite is quarried in this direction nearly as far as Providence, Rhode Island; also at Fall River and Troy, in Massachusetts. On the northern shore of Massachusetts Bay, between Salem and Cape Ann, are several localities of granite similar to that of Quincy. Granite is also quarried in the neighborhood of Lowell, Massachusetts, and in Pelham, New Hampshire.

"Granite or syenite, where the feldspar is lighter colored than in the Quincy granite, has been extensively quarried in some parts of Maine. This is generally preferred in New York; still, in weathering, the stone becomes nearly as dark as that of Quincy. Numerous quarries might be mentioned in the State of Maine, among which are those of Blue Hill, Buck's Harbor, and Seal Harbor, near which are several quarries belonging to the State. From this place large quantities have been shipped to New York. Granite has been quarried and shipped to considerable extent from Edgecourt, Bath, Brunswick, Kennebeck, and other places on the coast of Maine.

"Although there are numerous localities in the States south of Pennsylvania, where granite, syenite, or granitic gneiss of good quality for building stone may be obtained; yet the general character of the rocks of this style is far from being as good at that of New England. They are more or less subject to rapid disintegration; and in many places this character prevails to such a degree as to render these rocks entirely unfit for any economical purpose requiring solid and durable stone. The exceptions to this character appear to be few and limited in extent. The low elevations and rounded summits of these rocks generally, is sufficient to show the influence of denudation and weathering upon their exposed surfaces.

"I do not conceive, indeed, that the same granite formations, which occur in Maine, eastern New Hampshire, Massachusetts, and Rhode Island, extend southward in an inland direction beyond the limits of New England. The granites of the eastern part of New England are decidedly distinct from those of western New England and New York. The former are doubtless in a great degree metamorphic of rocks of the age of the coal measures; while the latter, with the exception of northern New York, are metamorphic of the lower silurian rocks. The original mineral or lithological character of the sedimentary rocks has been the cause mainly of this diversity in character of the mineral products; though greater or less degrees of metamorphism, upon similar materials, have resulted to some extent in products of different characters.

"The granites of metamorphic carboniferous rocks, in eastern New England, are of much more economical importance than those of silurian and devonian age.

"*Other sources of materials for construction* may be enumerated. Trap or basaltic rocks afford an extremely durable stone, and well adapted to many purposes; but these are not very readily quarried. Mica, talcous and hornblende schists are sometimes used for rough structures, bridge abutments, dams, etc. Many schistose rocks, and especially the partially metamorphic slates of the Hudson River group, afford excellent materials for constructions under water; and, in some instances, have been found superior to the regular forms of quarry-dressed stones. Very recently the compact steatitic rocks of New England have come into use as a building stone in New York city. Although soft, and the surface readily injured, it is claimed that it is not more easily defaced than white marble; while its modest gray color offers a relief and an agreeable contrast to the dazzling white of the marble, the sombre brown of the Connecticut, and the glare of red brick walls."—J. H.]

135. Smith, Isaac T., *New York City.*—Producer.

Red slate, from Washington county, New York.

* Bruce's American Mineralogical Journal, p. 147.

[This article is the product of quarries recently discovered, where it occurs in inexhaustible quantity. It has a good color, and is adapted for paving the floors of halls, public buildings, churches, &c. For roofing, also, its quality is good, and, on account of its color, will present an unusual appearance. In the same quarry is also found a light-green colored slate, adapted for roofing purposes.]

136. West Castleton Slate Company, *West Castleton, Vermont.*—Producers.
Roofing-slates, from Castleton.

137. Root & Tomlinson, *Castleton, Rutland County, Vermont.*—Producers.
Roofing-slates, from Castleton.

138. Eagle Quarry, *Vermont.*—(Agent, F. Hollin, *New York City.*)
Roofing-slates.

139. Hogan, Edward, *West Poultney, Vermont.*—Producer.
Roofing-slates, from Washington county, New York.

140. Parry, Rowland, *Peach Bottom, York County, Pennsylvania.*—Producer.
Roofing-slates, from Peach Bottom.

[The roofing-slates of the United States are all derived from rocks of the newer metamorphic formation. Numbers 135, 136, 137, 138, 139, and 140, are from the metamorphic Utica slate, or from a part of the Hudson River group, in its metamorphic condition. These slates occur in Washington and Rensselaer counties, New York, and in the western part of Vermont, where they are extensively quarried.

In the same formation, in Pennsylvania, these slates, in a similar partially metamorphic condition, furnish large quantities of roofing-slates. The specimens No. 140 from Peach Bottom, Pennsylvania, are of this formation, as are numerous other quarries in the same neighborhood.

The range of this formation may be traced from Rutland county, Vermont, through Washington, Rensselaer, Columbia, Dutchess, Ulster, and Orange counties, New York, and thence it passes through New Jersey, Pennsylvania, and Maryland.

Roofing-slates, of a different character, are obtained in the town of Guilford, Windham county, Vermont (near Massachusetts), where it has long been quarried, and was formerly supplied in considerable quantities to the Boston market. This slate belongs to a formation of different age, and probably to the Marcellus shales of the Hamilton group, which have become metamorphic, and are associated with the gneissic and micaceous beds which succeed them.

Some years ago, slate quarries were opened in the towns of Barnard, Bingham, Kennebeck, and other places in Maine. Roofing-slates are also obtained at other localities in New England, but it is believed that they are not extensively wrought.

Roofing-slate occurs at the Cove of Wachita, in Arkansas; and, very recently, an effort has been made to work these quarries, for the supply of the Western market.]

141. Goldsmith, D. M., *Castleton, Vermont.*—Producer.

Flagging-stones.—Specimen of the adaptation of the Vermont slates for pavements. The pavement in the yard of the Mineralogical Department is formed of slates furnished by this exhibitor.

[*Flagging-stones* are of importance to all cities and large towns, and in degree inversely proportionate to the supply of durable brick, which is, of course, dependent on the quantity and quality of clay and brick earth in the vicinity.

Good flagging-stones are obtained in the United States from many different formations.

In the *newer metamorphic rocks* of New England, in many places, along the entire extent from Vermont to Long Island Sound, excellent flagging-stones are obtained from the gneiss and mica slate, and quartz rocks with mica. They are less abundant on the east than on the west of the Connecticut River.

Owing to the greater facility of transportation, and proximity to larger markets, the flagstones of this character have been more extensively wrought in Connecticut than in any other part of the United States. Nearly every city on the Atlantic coast has made use of them. These flagstones are chiefly a gneiss or gneissic mica slate, and the objections which may be urged against them are that, when used for curb-stones, they too easily split in the direction of the laminæ; many of them wear unequally, and become so smooth as to require roughening with the chisel, and not unfrequently slabs find their way into the pavements, which are soon destroyed by frosts.

A much more durable material is found in Killingly, Connecticut, in the western part of Berkshire county, Massachusetts, in the towns of Tyringham, Lee, and Washington, and extending thence northward. This is a compact quartz rock, with very little mica, and splitting into layers well adapted for flagging-stones.

In the same relative position, in the metamorphic rocks farther southward, flagging-stones may doubtless be obtained.

In the *older metamorphic rocks*, good flagging materials are not so abundant, though similar aggregates occur, and will be developed when the demand warrants the preliminary explorations.

The *Potsdam sandstone* often separates into layers of two to four, and six inches in thickness, and forms a good flagging-stone for sidewalks. The rock is often too granular and friable to bear severe wearing or concussion.

The *Hudson River group*, in numerous localities along the Hudson River, affords very good flagstones in its compact argillaceous sandstones; and the same is true of this formation in its western extension, and likewise southward, through New Jersey and Pennsylvania.

The specimens No. 140, cited at the head of this section, are from the partially altered shales of the Hudson River group; and, indeed, the principal part of all the gneiss and mica schist flagstones of western New England, already described, are from the same beds, in a more extreme degree of metamorphism. As this condition progresses, beds which are entirely shaly in their normal character become adapted, by increasing hardness, to uses of this kind.

The *Medina sandstone*, in some part of its extent, affords excellent flagging-stones. Large quantities have been quarried for the supply of the towns and cities on the Erie Canal, and on Lake Erie. The sidewalks of Buffalo are paved with these slabs, fine-grained, and compact, and still preserving, after many years, the beautiful "wave-lines," indicative of their littoral origin.

The *Clinton group*, in central New York, affords flagging-stones; and this group, with the preceding, furnish similar materials in Pennsylvania, while the same are also used in the streets of Lewistown, on the Juniata.

The *tentaculite*, or *water-limestone*, which embraces the thin-bedded impure limestones at the junction of the Onondaga salt group, with the lower Hilderberg group, affords good flagging-stones; but they have not the even surfaces, nor are they so durable as those of arenaceous character.

The *Hamilton group* furnishes the best flagging-stones in the United States. These are obtained from numerous localities along the Hudson River, from the top of the Hilderberg Mountains, southward toward the Catskill Mountains, and even still farther south. These stones are compact and fine-grained argillaceous sandstones, with smooth surfaces, and retaining sufficient roughness to require no attention after being once laid. The layers are from one to six inches in thickness, and can be obtained in slabs of six and eight feet square. Those of from two to four, and six inches thick, are used for sidewalks in the streets of New York, Albany, and other places on the Hudson River; in many instances, replacing the old walks of gneiss and mica slate, to which they are preferable in every respect. The larger slabs are often used for sides, bottoms, and tops of cisterns, and the thinner slabs for drain coverings.

Within a few years since the commencement of the workings of these quarries, the quantity shipped has increased to an enormous extent.

The *Portage and Chemung groups* (the fine-grained or Waverly sandstones of the West), afford an unfailing supply of good flagstones in western New York, Pennsylvania, Ohio, Kentucky, and Indiana. To the south-west, this character of the strata is in a great degree lost; and by far the best examples are seen in north-eastern Ohio, northern Pennsylvania, and south-western New York.

Flagging-stones are obtained from all the sandstone formations below the coal measures, and in some of the thin-bedded sandstones of these measures, but not of equal quality with those below.

The red sandstone of the Connecticut Valley (No. 134) affords good flagging-stone in numerous localities, in Connecticut and Massachusetts, some of which are wrought to considerable extent. Similar materials will be afforded throughout this formation, in New Jersey and southward.]

6.—*Minerals otherwise useful.*

(Salt, Gypsum, Agricultural Minerals, Paints, Mill-stones, Clay, Polishing-powders, &c. &c.)

142. Lattsom, J. W., *Salt Lake City, Utah.*

Mass of native salt, from the Valley of the Great Salt Lake.

[The various specimens of manufactured salt were referred to Class II., where some notes will be found on them under their appropriate heads. It remains, therefore, to speak here only of the geological relations of the various salt-producing regions of the United States.

At some period in the history of the United States, brine-springs are known to have existed in nearly every State in the Union. Many of these have proved valueless, and the locality of others is now lost. The principal sources of salt from brines, or salt-springs, at the present time, are the following:—

The *Onondaga salt-springs*, in the State of New York, have their origin in a formation of shales and marls, with bands of impure limestone, known as the "Onondaga salt group." This group, as already shown, extends nearly the entire length of the State of New York, passes through Canada, and is recognized at Mackinac; the brine-springs, however, are restricted to New York.

The product of the Onondaga brines, in 1853, was 5,404,524 bushels. Many of the brine-springs formerly known, and to some extent used for the manufacture of salt in New York, are in the Medina sandstone, a formation much lower in the series than the Onondaga salt group. The *brine salt springs of Michigan* belong to a formation of much more recent date than the Onondaga salt group, and brine-springs which have thus far proved of little value occur in the southern part of the State of New York, having their origin in rocks of the Portage and Chemung groups, or those of devonian age.

The *brines of Pennsylvania*, Ohio, Virginia, Kentucky, and Illinois, have their origin chiefly in rocks of the carboniferous age.

The total product of salt manufactured in Pennsylvania, according to the census returns of 1850, is 184,370 barrels. The total amount manufactured in Virginia is set down at 3,480,966 bushels, of which 3,025,966 were manufactured at the Kanawha Salines. In 1853, the product of the Kanawha Salines was about the same as stated above, though several wells and furnaces are not in operation. It is estimated that

the wells and furnaces in the Kanawha Valley, when all in operation, are capable of producing half a million of bushels of salt annually, in addition to the above amount.

The total product of the salt wells of seven counties in Ohio is 552,100 bushels.

The total product of two counties in Kentucky is set down at 252,500 bushels.

Gallatin county, Illinois, produces 20,000 bushels of salt annually.

The several products enumerated above, amounting to 4,858,676 bushels,* may be regarded as essentially derived from the carboniferous formation, the total product being somewhat less than that from the Onondaga salt-springs of the State of New York.

The only rock-salt yet discovered in the United States is that of the valley of the Holston, in the southern part of Virginia. This bed of salt was reached at a depth of 220 feet below the surface, and was afterwards proved to extend to a depth of 386 feet, without the bottom having been reached. The geological position of this salt is regarded to be in lower carboniferous, and below the strata furnishing the brines of Kanawha, and other localities in western Virginia. This rock-salt, and the salt-wells of the vicinity, are reported to yield 265,000 bushels, which is included in the preceding summary. Specimens of this salt were in the collection of Dr. Genth. No. 80.

The salt of Arkansas is believed to be of tertiary age, and from many facts obtained relative to the salt of Texas, which is probably of the same age, we may infer that it is even of the modern tertiary period. The salt-works of Arkansas are not at this time in operation; from Texas, the returns are 6,000 bushels.

The salt and brines of the Great Salt Lake Valley, represented by No. 142, have not been satisfactorily referred to any geological formation. On the west of the Rocky Mountains, and between that range and the Salt Lake, tertiary formations cover extensive areas, and may be the source of the brines, and of the salt itself, which is certainly a very modern accumulation. On the other hand, it has been shown that carboniferous rocks, in high mountain ranges, occur in the immediate vicinity of the Salt Lake, and for a long distance to the north, west, and south; and it is not improbable, perhaps, that these brines have their origin in part of this formation. With our present knowledge, however, the source of the salt and brines of this region cannot be with certainty determined.

The brine-springs of Michigan are near to the outcropping, or within the limits of the carboniferous formation; and the source of this brine is probably in rocks of this age, or, perhaps, in part, within those lying immediately below the carboniferous beds. No returns have been made from these springs, and they are not at present in use.

Dr. L. D. Gale, who examined specimens of water and salt from the Great Salt Lake, brought home by Captain Stansbury, reports that the water of this lake contains full twenty per cent. of pure chloryd of sodium, and not over ten per cent. of other salts, being one of the purest and most concentrated brines in the world. The well of Syracuse, in New York, the strongest examined by Professor L. C. Beck, contains 17·35 per cent. of salt.]

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143. Thompson, John A., *Cayuga Bridge, New York.*—Producer.

Plaster, from Cayuga Bridge.

This is known in commerce as "Premium Cayuga Plaster," and is from a bed that has been worked for fifty years. It is associated with native sulphur. The annual product is about six thousand gross tons, and its market is chiefly agricultural.

[The productive source of gypsum, in the United States, is confined to the silurian, carboniferous, and tertiary formations, so far as yet known. The red sandstone of the Connecticut Valley, although usually referred to the period of the new red sandstone of Europe, which is one of the chief repositories of salt and gypsum, has produced neither of these minerals.

The only representatives of gypsum in the collection are specimens from Cayuga county, New York.

The Onondaga salt group, of New York, produces immense quantities of gypsum, but within a limited area, extending from the vicinity of Syracuse on the east, to within Genessee county on the west. The same strata are again productive of gypsum in Canada West.

Gypsum in large quantities is associated with the rock-salt of Washington county, Virginia.

The carboniferous strata of Iowa contain valuable beds of gypsum, according to the investigations of Dr. D. D. Owen.

The tertiary formations of the south-west contain gypsum widely diffused, and it is reported that large quantities occur in many places in Texas and Arkansas.

Large quantities of massive gypsum are imported into the United States from Nova Scotia. Numerous localities, and different geological formations afford crystallized fibrous gypsum, and small massive specimens of alabaster, &c., but not in quantities to be of economical importance.]

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144. Phosphorite Company, *New York City.*—Producers.

Specimens of phosphate of lime, in mammillary concretionary forms (enpyrchroite of Emmons) from Crown Point, Essex county, New York.

Specimens of massive apatite, from Hurdstown, Morris county, New Jersey. Very large crystal of apatite, from the same.

[This mineral is of economical value as a fertilizer, and, on this account, its occurrence in a massive form, or otherwise in quantity, is a matter of much interest. It is known to occur in considerable quantities in the older metamorphic formations of northern New York, and in the newer metamorphic rocks of New Jersey, from whence the above specimens are taken. It has been found somewhat abundantly, in the form of nodules, in the lower silurian rocks of Canada, and in the shaly limestones of the upper silurian period in New York.

Some years since, a vein or bed of this mineral, intermixed with carbonate of lime and earthy matter, was found in the older metamorphic rocks, near Crown Point, New York (as above). More recently, it has been mined in considerable quantities by the Phosphorite Company, and sold in market, and also shipped to England. It has, however, been proved to contain too large a proportion of other ingredients for distant transportation. Some portions of the bed yield specimens of tolerable purity, which were represented in the collection.

The same mineral, where occurring in massive form in New Jersey, is of more crystalline structure.

Numerous localities in the United States furnish mineral specimens of this substance, but those mentioned are believed to be the only ones promising any product of economical value to the agriculturist.]

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145. Sanford, John, *Troy, Wisconsin.*—Producer.

Sample of marl, from Troy.

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146. McGregor, John & Co., *Burlington, Vermont.*—Producers and Manufacturers.

Specimen of white limestone (marble), and of lime made from it.

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147. Johonnot & Saunders, *Boston, Massachusetts.*—Manufacturers. (Agent, Cullum Haven, *New York City.*)

Tripoli from the State of Maine.

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148. Van Amringe, A. Y., *Rye, New York.*

Feldspar, from Rye; emery with margarite; a large number of specimens of massive emery, and twelve samples of pulverized emery of different degrees of fineness, from the island of Naxos, Grecian Archipelago.

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149. Hastings & Co., *New York City.*—Manufacturers.

Crushed and pulverized quartz, prepared for use as a polishing powder.

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150. McLeran, E., *Wells River, Vermont.*—Manufacturer.

Polishing powder (ground quartz rock?) of various degrees of fineness; specimens of quartz rock; graphite; iron slags, etc.

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151. Smith, Rev. D. M., *Durham, Connecticut.*

Whetstones.

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152. Phillips, Professor, *of the University of North Carolina.*

"Novaculite" (?) a soft granular stone used for oil stones, from Chapel Hill, North Carolina.

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153. Dickinson, Zelotes, *New York City.*—Producer.

Specimens of slates, and of oil stones, exceedingly fine-grained, composed of pure silica, from Marquette, Michigan. Specimens of slate from the quarries of the New England Mining and Quarrying Company, at Vernon, Vermont.

[Whetstones of every degree in quality are obtained from the older and newer metamorphic formations. The finer varieties of mica schist and talco-micaceous schist, afford a great abundance of common whetstones, scythe stones, etc.; and large quantities are manufactured in Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine; but there was no representative in the collection at the Crystal Palace.

The entire extent of country west of the Green Mountain range, is almost entirely supplied with these articles from New England; and the amount consumed is very large. The quality varies from compact close-grained quartzose rock, scarcely yielding at all to the steel, to fine and fissile material, which wears rapidly, and of which great quantities are consumed; and notwithstanding the abundance of good material existing, large quantities of the inferior qualities find their way to market.

The limited space assigned to the mineralogical collection, forced the directors to exclude some of the more bulky products of the mineral kingdom entirely. Among these were millstones and grindstones, so abundantly produced in the United States. A few words, upon their geological relations, may not be out of place in this connection.

The millstones of the United States are derived from the newer metamorphic rocks, from the Silurian conglomerates, and from the conglomerates below the coal measures. The conglomerates of the newer red sandstone are also adapted to this purpose, and have been used to some extent.

In the eastern part of Massachusetts, syenite is principally used for this purpose: it is quarried near Salem and other places. In the western part of Massachusetts and Connecticut, there is a porous quartz rock associated with the mica and talcose schists which is well adapted to the manufacture of millstones. The greenstone of New England is also proper for this purpose, but has scarcely been used. The coarse granites or syenites, throughout the newer metamorphic formations, have been found adapted for millstones, and more or less used from Maine to Georgia. In Virginia and North Carolina the older rocks may be less employed on account of the substitution of millstones from the conglomerate of the newer red sandstone, or liassic group.

The Shawangunk conglomerate, which lies at the base of the Upper Silurian strata, has been largely used for millstones; and the long famous "Esopus millstones" are manufactured from this rock near the Hudson river, at the north-eastern termination of the Shawangunk mountain. The accessibility to water transportation, has

* Estimating the 184,870 barrels of Pennsylvania at three bushels each, or 553,110 bushels.

herctofore given great advantages to this locality; but the introduction of the French buhr stone has nearly superseded the use of the Esopus millstones.

The conglomerates of the coal measures have but rarely the firmness or tenacity to fit them for the use of millstones.

The conglomerate of the red sandstone of the Connecticut valley has been used in some instances for millstones; and those of the same age in Virginia and North Carolina have also been wrought for this purpose.

The buhr stone of the coal measures in Ohio is a kind of porous sandstone, well adapted for millstones; which are extensively manufactured in several towns in Muskingum county.

The buhr stone of Georgia is of tertiary age. It has not proved equal to the French buhr stone, and is in limited use. That of South Carolina is represented by the State geologist to be equal to the French buhr stone; but it is not much employed.

Grindstones are obtained from the sandstone of the upper part of the Hudson river group, in Oswego county, New York; and the same rock is adapted to their production, in other places.

The Medina sandstone has been used locally for this purpose, but it is usually too course and sharp-grained.

The extensive series of shales and sandstones from the Hamilton group to the coal measures inclusive, furnish almost innumerable localities where grindstones can be extensively manufactured. A few grindstones are manufactured from the higher beds of the Hamilton and Portage groups in the eastern part of New York. In western New York there are beds of sandstone in the Chemung group which afford excellent materials for grindstones, and the same formation in northern Pennsylvania is likewise capable of producing similar grindstones in large quantities; but they have been manufactured only to supply the local demand.

Some beds of argillaceous sandstone of corresponding age in Ohio have furnished large quantities of grindstones. The town of Besca mainly owes its commencement and prosperity to its grindstone quarries, from whence are supplied a large part of the western States bordering the Lakes. The same formation extends southward through the entire length of Ohio, and flanks the coal measures in the eastern part of Indiana; affording many localities where the rock is adapted to the manufacture of grindstones. The same is true of these formations flanking the eastern margin of the Alleghany coal field; but they are not much wrought, except for the local wants; and it not unfrequently happens that better material exists in the neighborhood than that brought into use.

Some beds of the newer red sandstone of the Connecticut valley are adapted to the manufacture of grindstones, as well as the same formation in its southern extension; but they are produced only in a few places, and, so far as known, in quantity only to supply the local demand.

The same mineral varieties are disseminated throughout the metamorphic formations as far as Georgia and Alabama, and locally used to some extent; but the greater part of these materials are brought from the north.

Common whetstones of very good quality can be obtained in large quantities at L'ance Bay, on Lake Superior. At Marquette, (whence the exhibitor No. 153 has his specimens), in the same region, the material is of the finest quality, and fit for oilstones, being quite equal to any to be found in the market. The only objection observed in those exhibited, was the occurrence of narrow veins of pure quartz, which being harder than the surrounding mass, would cause the stone to wear unequally. But this can, doubtless, be avoided by proper care in the selection of the materials.

Some specimens of common whetstones, of excellent quality, of the finer varieties of talco-micaceous schist, were sent to the Exhibition from North and South Carolina. (No. 152).

An oilstone of very superior quality, obtained in Arkansas, has been in use for some years. It is derived from a siliceous, metamorphic formation.

Other sources of common whetstones might be named, but those enumerated are believed to be the chief sources of supply in the United States.]

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154. Rose, J. M.
Feldspar, from Greenwich, Connecticut.

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155. Jones, John.
Feldspar, white, from Newcastle county, Delaware.
Specimens of belemites, and marl (green sand), from the head-waters of the Bohemia River, Delaware.

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156. Graham, H., & Co., *New Garden, Chester County, Pennsylvania.*
Specimens of kaolin and fire-brick.

[Kaolin, or porcelain earth, is derived from the decomposition of the feldspathic granites of both the older and newer metamorphic rocks.

It is obtained in abundance at Wilmington, in Delaware, and occurs in considerable quantities in several localities in Pennsylvania and Maryland. Beds of great extent and purity are represented as occurring in South Carolina, and as the granites of the Southern States are much more disposed to decomposition than those of the North, we may expect to find this material in large quantities along the range of this formation.

Clay for the finer kinds of pottery exists abundantly. The fine tertiary clays are disseminated throughout the whole of the tertiary belt containing the hematite, which has been previously described. Some of the beds of this formation are very pure, resembling kaolin in character. This belt of formation will, doubtless, afford an abundant supply of clay fit for pottery and for fire-brick, at numerous points throughout its entire extent. (See Brandon Car Wheel Company, No.)

Other beds of tertiary clay are fit for the common kinds of pottery, and for fire-brick.

Numerous beds of fire-clay occur in the coal formation, and are as widely diffused as the coal itself; these afford abundant supplies for fire-brick and common stone-ware. The tertiary belt and the coal formation may be regarded as reliable for producing the so-called fire-clays.

The most constant source of the refractory clays, as well as the finer varieties of clay for earthen-ware, if not also for porcelain, will be found the tertiary belt, along the Atlantic slope; including in this term those beds which have evidently been derived from the decomposed granite, but which have been transported and redeposited.]

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157. Ziegler, S., & Co., *St. Genevieve, Missouri.*—Producers.
White sand, for glass-making.

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158. Le Duc, M., *St. Paul's, Minnesota.*
Quartz sand from St. Paul's, and glass made from it. Indian pipe-bowl. Specimens of Lake Superior native copper.

[The materials for glass-making are widely distributed, and so numerous are the localities where such can be obtained, that the mere enumeration would occupy pages. We shall simply mention a few of the sources.

The granular quartz of the newer metamorphic formation (the altered Potsdam sandstone) in Lanesborough, Cheshire, and Stockbridge, in the western part of Massachusetts, furnishes an abundant supply of the finest material for glass-making. In these localities, the rock is in such a state of disintegration as to allow the material to crumble into a beautiful white sand. Other localities could doubtless be found in the same range, to the north or south of Berkshire county. Granular quartz, or sandstone, in similar geological position in the Southern States, furnishes sand for glass manufacture.

The Potsdam sandstone, throughout its wide extent, affords material for glass-making. In northern New York it has long been used for this purpose, and there are numerous localities along its northern outcrop, extending westward to the Mississippi River. The specimen from Minnesota (No. 158), is from a sandstone forming essentially a part of the Potsdam sandstone, being a repetition of the same deposit above the calciferous sandstone, as already described.

This sandstone along the banks of the Mississippi (as, for example, at St. Paul's whence the specimens sent were) is in such a friable or disintegrated condition, that it may be shovelled up like ordinary loose sand, and in many places it is admirably adapted to the purposes of glass-manufacture.

The sandstones of the Shawangunk conglomerate, though usually too much stained with iron, have been used to obtain sand for this object.

Some beds of sandstone in the coal formation are sufficiently free from iron to furnish sand well adapted for glass-making, and which is extensively used.

Some of the sands of the tertiary formation, particularly those associated with the tertiary belt already described, and also sands occurring with the other tertiary formations, are adapted to the manufacture of glass.

The sands on the sea-coast are often sufficiently pure for this purpose, while, for the more common kinds of glass, sand of the alluvial formation is frequently used.

The sandstones of several of the formations are used for furnace hearth-stones; the more porous beds of the Potsdam sandstone, the Oriskany sandstone, and many of the beds of sandstone in the coal measures, as well as, to some extent, others below these.

Some of the beds of the newer red sandstone are adapted for this purpose, and also the porous quartz rock of western Massachusetts.]

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159. Ruggles, George H., *Boston, Massachusetts.*
Specimens of mica (Muscovite) in plates of immense size, two to three feet in diameter, used for stove-plates and other purposes, from Grafton, New Hampshire.

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160. Bowers, J. & J. S., *South Ackworth, New Hampshire.*
Plumose mica, tourmaline, feldspar, rose-quartz, and beryl, from South Ackworth. Mica (Muscovite) in large sheets.

[The use of mica for stoves is believed to be an American peculiarity, and its use is confined to those stoves which are designed to burn anthracite. The object is, to afford a view of the fire without interrupting the draft. For this purpose, mica alone possesses the requisite properties. It is elastic, easily cut, and adapted to fill the openings, and it is uninjured, except by long-continued heat.]

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161. Smith, Thomas, *Bainbridge, Geauga County, Ohio.*—Manufacturer.
Yellow and red ochres.

[The tertiary belt, so frequently referred to as extending throughout the greater part of the length of the United States, from North to South, affords an abundant supply of ochreous materials. The clays are stained yellow or brownish-yellow with iron, and in Vermont and Massachusetts there are numerous localities which may furnish any desired amount of such materials. The specimens (No. 161) are from the same formation as the hematite ores of Vermont.

Ochres of excellent quality are mentioned by the geologist of South Carolina as occurring in the eocene tertiary of that State, and it is probable that such deposits will be found co-extensive with the formation of this age.

Steatite, or soapstone ground in oil, is used in many places as a paint, and is regarded as a good material for common uses.

Very lately, substances called mineral paints have been extensively brought into use. None of these can have any superior claim to merit, as they all consist of variable proportions of clay and sand, sometimes with lime, magnesia, and iron, which do not, however, give them any additional value. The shales of several geological formations have been used for this purpose. The red and reddish shales of the Hudson River group have lately been introduced as mineral paints, and other similar materials are before the public.

If these are valuable as paints, then the whole length and breadth of the United States are supplied abundantly with mineral paints in their beds of shales and clays, and every individual may manufacture his own. It is extremely doubtful, however, whether the extra quantity of oil required to produce an equivalent result in covering the surface of the wood does not make them, finally, more expensive than the ordinary colors used in painting before these materials were introduced.

The clays of the tertiary formation are often of a bright pink or purplish color, and might be used to some extent as paints, in the absence of better materials.]

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162. Gaston, N. H., *New Haven, Connecticut.*

Large crystals of heavy spar, from Cheshire, Connecticut. Masses of the same, fit to grind for paint.

[This mineral is largely used for adulterating white lead for paints; and is even used by itself for a paint. The white varieties are preferred, but it is possible to remove a good deal of admixed impurity of color (clay, oxyd of iron, etc.) by digestion in dilute sulphuric acid with steam. Beside the specimens from Cheshire, there are shown others from Fauquier, Orange, and Washington counties, in Virginia. It is found in large quantities at Hatfield, Massachusetts, in Nova Scotia, and at other places, less abundantly. A vein of the massive and compact variety of this mineral occurs in Trenton limestone at Pillar Point, Jefferson county, New York. Its color is objectionable for grinding, but it furnishes beautiful ornamental blocks for polishing.

The veins at Cheshire have been worked for about 15 years. Some 25,000 tons of the minerals have been raised, but the increase during the latter part of this period has been rapid. In the three last years from 2,000 to 2,500 tons have been raised annually, and the current year more than the latter quantity will be raised. The mineral as raised, and before it is prepared for market, may be worth $12 per ton. The active competition of the foreign article prevents the business from being very lucrative.]

7.—*Minerals of scientific interest.*

(Including special collections loaned for exhibition).

163. Tomes, Francis, & Sons, *New York City.*—Proprietors.

Fine crystal of emerald, in delomite, containing pyrites, from the mines of Muzo, near Bogota, New Granada.

Models of the Koh-i-Noor and Grand Mogul diamonds.

[This emerald is from the most celebrated locality of that gem ever discovered. They occur in a vein of dolomite which traverses a hornblende rock at Muzo. The emerald and beryl are varieties of the same species, the fine green of the emerald being due to a minute quantity of oxyd of chrome (= 0·30 in 100). The celebrated crystal belonging to the Duke of Devonshire measures 2·36 inches by 1·97 inch on the terminal plane, and the height of the prism is 0·165 inch. This magnificent specimen was shown at the London exhibition.

Emeralds of a much larger size, but of inferior quality, occur in Siberia. All the old European localities afford stones of very inferior beauty compared to those from the New Granada mines].

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164. Shepard, Professor C. U., *New Haven, Connecticut.*—Proprietor.

Green and red transparent tourmalins, Paris, Maine.

[These are probably the most remarkable crystals of tourmalin, for their beauty as gems, that have ever been found. They were discovered by the proprietor in the soil near Paris, in Maine, more than twenty-five years ago. The prisms exceeded an inch in diameter, by twice that length. They have a ruby red color within, surrounded by green, or are red at one extremity and green at the other. Portions of the crystals are perfectly free from cracks and quite transparent. The red is nearly that of the spinelle ruby, and the green is lively and deeper than that of the aqua marine, but entirely free from that heavy blue color seen in the Brazilian stones; portions of them which have been set as gems possess uncommon beauty, and are regarded by jewellers as quite unique. The electrical properties of this species are very noticeable in these cut specimens, from the rapidity with which they attract dust and light bodies from the atmosphere. Very few of these fine crystals were found, and none since their first discovery].

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165. Genth, Dr. F. A., *Philadelphia, Pennsylvania.*

A collection of first-class cabinet specimens of minerals from various localities.

[This collection embraced about 130 specimens, mostly metals and their salts. Among them there were many noticeable for special interest. Such was a specimen of gold, pseudomorph after spathic iron (?) It presented a surface of splendid brilliancy and perfect polish, showing a cast of crystalline faces of some mineral (probably spathic iron,) upon which the gold had been deposited. The substratum upon which the gold rested appeared to be tetradymite, (or telluret of bismuth,) this very rare species occurring at the White Hall mine.

Dr. Genth's collection was also of special interest from the selection which it presented of the characteristic gold-bearing rocks of Virginia and North Carolina, and their associated minerals; several of which Dr. Genth has for the first time observed in the United States, e. g., boulangerite and gray copper from Buckingham county, and tetradymite from several localities. The yellow copper ore of Barnhardt's mine proves to be a new species of ore, yielding 48 per cent. of copper. The rock-salt from the Holston river, Virginia, is of special interest, as being the only place where rock-salt has been found in the United States proper. The annual yield is stated at 400,000 bushels of 50 pounds, and of a very superior quality.

The gold ores from Garnet's mine are of considerable interest, as showing gold associated with garnets in a quartzose gangue with magnetic pyrites, the gangue not having in the least the ordinary aspect of an auriferous rock. Indeed in this particular the collection of gold-bearing veins, made by Dr. Genth, was novel and instructive, materially enlarging our previous notions of the modes of occurrence of this precious metal. The collection of ores from Washington mine, North Carolina, was of interest in illustration of the valuable notes on the mineralogy of that mine by Dr. Genth, under No. 78.]

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166. Vaux, William S., *Philadelphia, Pennsylvania.*

A collection of select cabinet specimens of various American and foreign minerals, from the private cabinet of the exhibitor.

This collection numbered 172 specimens, of peculiar beauty and interest to the mineralogist. It was strikingly rich in finely crystallized specimens. (See note to next number.)

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167. Clay, Joseph A., & J. Randolph, *Philadelphia, Pennsylvania.*

A series of 106 very choice cabinet specimens of various American and foreign minerals from the private cabinet of the exhibitors.

[This and the last collection (from Mr. Vaux) were of much general and scientific interest. The proprietors are well known as zealous and well-informed mineralogists, whose cabinets are rich in the choicest and rarest specimens, collected during many years with untiring assidnity. With the greatest liberality, they permitted selections to be made from all that was most choice and desirable in their cabinets. It is impossible to enter upon a specification of the characters of individual specimens, nor is it necessary, as most of them are from localities which have become classic with mineralogists. The long residence of Mr. Randolph Clay, in a diplomatic relation, near the Courts of Austria, Russia, Spain, and Chili, have given him uncommon facilities for the collection of some of the rarest and most highly valued of minerals, from localities usually quite inaccessible to those engaged in mineralogical pursuits in this country.]

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168. Bynum, J. G., *North Carolina.*

Quartz crystal pseudomorph of calcite, hollow, and nearly filled with fluid.

[These pseudomorphs, from North Carolina, are well known to collectors, but it is not common to find them containing water, like this exceedingly curious one.]

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169. Lockwood, L. J., *New York City.*

Specimens of agate, from Lake Superior.

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170. Ellison, J., *Middleville, New York.*

Very fine crystals of quartz, from Middleville, Herkimer county, New York.

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171. ——— ———

Specimens of silicified wood, from California.

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172. Hitchcock, E., Jr., *Amherst, Massachusetts.*—Proprietor.

Very large crystals of spodumene and almandite, from Norwich, Massachusetts.

[Spodumene was first obtained in distinct crystals, by Messrs. Hitchcock and Hartwell, from the Norwich locality. Before this, it was known only as a mineral occurring in cleavable masses, and possesses a considerable scientific interest from the fact that it is one of the few minerals containing the rare alkali lithia. The analysis of this variety by Brush showed about five per cent. of lithia. The crystals from this locality have been most carefully studied by Dana, who has described them in his mineralogy. The two most interesting forms which have ever been found at this locality are in the cabinet of Professor B. Silliman, Jr., and were among the specimens on exhibition. It was one of those which Professor Dana has figured. The almandite, which is associated with the spodumene of this locality, is a phosphate of iron and manganese. Both these minerals occur in a mass of granite, in the newer metamorphic rocks, about ten feet square on the surface, and from five to six feet deep. This granite is in a matrix of mica slate. Black tourmalins, beryles, and one crystal of oxyd of tin have also been found at the same locality. The locality is now quite exhausted. The almandite is much more rare than the spodumene, not over ten or twelve fine crystals having been found.]

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173. Hamilton College, *Clinton, Oneida County, New York.* (By Professor O. Root.)—Proprietors.

Crystallized minerals from northern New York, embracing apatite, twelve crystals of calcite from Rossie, gypsum, heavy spar, galena, phlogopite, feldspar, zircon, sphem, scapolite, &c., twenty-nine specimens, all finely crystallized.

[The metamorphic rocks of northern New York, in the counties of St. Lawrence, Jefferson, and Essex, have been long celebrated for the size and beauty of their crystallized minerals. This region was very amply represented in the Exhibition, not only by the present collection, but also by that of Judge Dodge (No. 175), Mr. Wilder (No. 174), Dr. Conkey (No. 176), and others.]

174. Wilder, L., *Hoosic Falls, New York.*

A large collection of choice cabinet specimens of minerals, principally from the localities in the State of New York, extending to about 150 specimens.

[This was a very rich display of the mineralogy of the State of New York, from the cabinet of a well-known and most industrious collector.]

175. Dodge, Judge, *Gouverneur, New York.*

Minerals from various localities in St. Lawrence county, New York, including pig and bar iron from the furnaces at Fullerville, in Fowler, New York.

176. Conkey, Doctor, *Antwerp, New York.*—Proprietor.

Specimens of specular iron (amorphous and in mammillary concretions), and acicular crystals of millerite (sulphyd of nickel), Sterling mine, near Antwerp, New York.

177. Bouane, William Oland, *New York.*

Choice cabinet specimens of American minerals.—Brucite, from Hoboken; sphem, in very large crystals, from Diana; and from Muscalunge, orthoclase, &c., &c.

178. Remington, R. P., *Ogdensburg, New York.*

A collection of mineralogical specimens from various localities, domestic and foreign, embracing thirty-one specimens, all of metallurgical interest.

179. Silliman, Professor B., Jr., *of Yale College, New Haven, Connecticut.*

Various American minerals, selected with a view of illustrating some of the best known or most noted American localities and species.

[This collection embraced about 150 specimens, chiefly distinct crystals. Among the more remarkable, was a tubular crystal of columbite, from Haddam, weighing about two pounds and a half, finely finished, and with the characteristic metallic tarnish.]

180. Union College, *Schenectady, New York.*

Copper glance, in crystals, and copper pyrites, from Bristol, Connecticut; selected from the cabinet of Union College.

181. Merriam, Lewis, *Greenfield, Franklin County, Massachusetts.*

Minerals from the cabinet of Dexter Marsh (deceased) of Greenfield.

182. Leonard, F. B., *Lansingburg, New York.*—Proprietor.

Collection of fifty-two cabinet specimens of minerals, from various American localities.

[This collection contains some exceedingly select specimens, and among them distinct crystals of chrysoberyl, from Greenfield, New York, the only locality of this rare species in the United States which has furnished distinct crystals.]

183. Hubbard, Professor O. P., *Dartmouth College, Hanover, New Hampshire.*—Proprietor.

Specimens of native gold in quartz, from Bridgewater, Vermont.

Large mass of transparent smoky quartz, penetrated in every direction by beautiful acicular crystals of rutile.

[The latter is one of the most beautiful specimens exhibited.]

184. Seal, Thomas F., *Unionville, Pennsylvania.*

Copper glance, Bristol; rutile, Pennsylvania.

Corundum (massive and granular), kyanite, white feldspar, white marble, from Unionville.

Chromic iron, from Texas, Lancaster county, Pennsylvania.

[The specimens of rutile shown by this exhibitor were esteemed the finest ever found, and excited the admiration of all who saw them.]

185. Stone, Charles S., *Brooklyn, New York.*

Marmolite, talc, and asbestus from the Quarantine, Staten Island, Richmond county, New York.

Minerals from Hoboken, New Jersey.—Magnesite, arragomite, crystallized hydromagnesite, amorphous hydromagnesite, marmolite, brucite, and fibrous brucite (nemalite).

[The masses of brucite, from the long celebrated locality at Hoboken, shown by this exhibitor, were truly wonderful for size and purity.]

186. Gold, Theodore S., *West Cornwall, Connecticut.*—Proprietor.

Minerals from Litchfield county, Connecticut.

[The iron ores from Salisbury, and the washingtonites, of Litchfield, Connecticut (a variety of titalliferous iron), were particularly worthy of notice.]

187. Blake, William Phipps, *New York City.*—Proprietor.

Specimens of artificially crystallized oxyd of zinc, from the flues of the furnaces of the New Jersey Zinc Company, crystallized in needles like hair-salt, and in drusy botryoidal masses.

Specimens of artificially crystallized oxyd of chromium, from a bichromate of potash furnace.

Emerald nickel, Texas, Lancaster county, Pennsylvania.

Rhodochrome (pyrosclerite), Texas, Pennsylvania.

Lamellar red zinc ore, from Sterling Hill, Sussex county, New Jersey.

Specimens of beryl, nacrite, pennite, rutile.

Red copper ore.

Willemite (in crystals two and three inches in diameter), massive apatite, and franklinite in very large octahedrons, red zinc ore with calcite, red corundum, red corundum with calcite, and chondrodite, all from Sussex county, New Jersey.

188. Gillis, Lieutenant James M., *United States Navy, Washington, District of Columbia.*

Silver and other ores from Chili, collected by the exhibitor during his residence in that country, while engaged as the head of the United States Astronomical Observatory in that country.

The ores were native silver, horn silver, bromid, chlorobromid, and iodyd of silver, ruby silver, polylarite, and other silver ores, with mispickel, galena, realgar, &c.

189. United States Government.

Collection of Chilian ores of silver, copper, mercury, cobalt, &c., made by Lieutenant Gillis, United States Navy.

[These two collections were of particular interest, and embraced ores rarely seen before in this country, although sufficiently common in Chili. It is a fact worthy of record, in this connection, that the most valuable of the Chilian mines now worked, have been discovered since 1838, and the most valuable of all since 1847. The shares in this mine (*Buono Esperenza*) originally worth $20 each, are now worth $80,000 each.]

190. Baird, Professor S. F., *of the Smithsonian Institution, Washington, District of Columbia.*

Iron ores and furnace products, from Norway.

Native silver from Copiapo, Chili; cinnabar, California; native gold, Abbeville, South Carolina; specimens of semibituminous and anthracite coals, from the Island of *Taewan* (Formosa), on the coast of China; anthracite, from Fo-kien, China; limonite, from Kiang-si, China.

Minerals from Georgia.—Native gold in quartz, milky opal, hornstone, buhrstone, and kaolin.

Marble for the Washington monument, from Symington's quarry, Maryland.

Hudson River slate, New York.

Gneiss from Port Deposit, Maryland; granite from Owen's Mills, Maryland; granite from Ellicott's Mills, Maryland.

Minerals from New Jersey.

191. Beadle, Rev. E. R.

Quartz crystals and brookite, from Little Rock, Arkansas.

[This is believed to be the largest single crystal of brookite in any collection in the United States.]

(The collections from No. 168 to No. 191, inclusive, were kindly loaned to the Director of the Mineralogical Department, by their several proprietors, for the purpose of exhibition, with no other object than a laudable desire to promote the interests of science, and forward the purposes of the Exhibition.)

192. King, Roswell A., *Lexington, Davidson County, North Carolina.*—Proprietor.

Specimens of North Carolina minerals, illustrating particularly the Washington silver mine in Davidson county, which has been so ably treated of in the notes of Dr. Genth (No. 78.) The species exhibited are there enumerated. Mr. King exhibited bars of metallic silver, believed to be the first ever smelted from the ores in the United States. The collection also embraced the coal of Deep River, and other interesting minerals of that State.

193. Smith, Dr. J. B., *New York.*

Fossiliferous limonite, chabazite, and gypsum, from Nova Scotia; gypsum, from New Brunswick; graphite, from St. John's; gypsum, from the Mammoth Cave, Kentucky.

194. Lane, E., *Trumbull, Connecticut.*

Minerals from Fairfield county, Connecticut.

Magnetic pyrites from Lane's mine; native bismuth, molybdenite, tourmalin, topaz, fluor spar (variety of chlorophane), beryl, rutile, margarodite, and scheelite, from Trumbull.

[The massive topaz of this locality has been ground, for the purpose of procuring a polishing powder as a substitute for emery, with tolerable success. Numerous interesting minerals have been procured from "Lane's mine." Among the most curious are tungstic ochre and wolfram pseudomorph of scheelite.]

195. Champlin, Dr. E. H., *New York.*

Minerals from Iceland, Egypt, etc., being silicious sinta from the great Geyser; lava from the Salmon river; volcanic products from the vicinity of the extinct volcano at Klausturholar; native sulphur from Kriswick; colored sandstones from Petra; silicified wood from the Arabian desert; fossil fish from near Beyroot, etc., etc.

196. Peet, Rev. E. W., *Rector of St. Paul's Parish, Rahway, New Jersey.*—Proprietor.

Trapezoidal garnets, in mica-slate, from Diamond Ledge, Fairfield county, Connecticut. Specimens of calcareous incrustrations upon grasses and reeds, from Solfatara lake, between Tivoli and Rome, Italy.

Chrysotile (variety of fibrous serpentine) in marmolite, from Montville, New Jersey.

197. Hull, S. P., *Morristown, New Jersey.*—Proprietor.

Chrysotile and angite, from Montville, Morris county, New Jersey.

198. Gebhard, John, *Albany, New York.*—Proprietor.

Several polished specimens of variegated marbles, quartz, etc., from Allahabad, in India.

199. —— ——

Specimens of apophyllite and chalcedony, from India.

200. Brewster, S. C., *Geddes, Onondaga county, New York.*—Manufacturer.
Artificial crystallizations of gypsum, formed in the salt vats.

201. Caldwell, John Henry, *Yonkers, New York.*
Crystallized copper pyrites, from Ellenville, New York.

202. Cowles, Calvin J., *Elkville, North Carolina.*
Specimens of flexible sandstone, graphite, gold ores, and Indian relics, from North Carolina.

[A good deal of interest is attached to the occurrence of flexible sandstone, since it is commonly regarded as the accompaniment of gold and of the diamond. Its mineralogical name is itacolumite, and it owes its lamination and flexibility to a little talc or mica. This rock accompanies the diamond deposits in Brazil and the Urals, as well as in Georgia and North Carolina, where a few diamonds have also been found. The flexible sandstone is said to occur at three places in North Carolina, viz., in Stokes county; in Wilkes county, about ten miles from Elkville; and in Burke county, on Linville mountain. Small diamonds are reported to have been found in proximity with it on Linville mountain.]

203. Payson, Ira F., *Stapleton, Staten Island.*
Iron pyrites in cubes, from the Green Mountains, Vermont.

204. Cooke, Robert L., *Bloomfield, New Jersey.*
Specimens of dogtooth spar, from Weyer's Cave, Virginia.

[This most beautiful and unique specimen was taken by the exhibitor from a large geode in the floor of one of the apartments of Weyer's cave, where it was accidentally discovered with many other beautiful calcareous crystallizations, the fall of a crowbar from the hand of the explorer having broken the thin crust that formed the level surface of the floor. This apartment had been avoided before 1833 under the impression that it was filled with carbonic acid. Owing to this circumstance, its beautiful vaults and geodes had remained uninjured until Mr. Cooke, in the course of a survey of the cave, ventured safely to explore its dreaded precincts.]

205. Knoepfel, Wm. H., *New York.*
Stalactites, from a cave in Schoharie county, New York; with a pictorial representation of the cave in section.

206. Howe, Lester, *Cobleskills, New York.*
Black marble, crystallized calcite, and stalactites and stalagmites, composed of calcite, from Howe's cave, Schoharie county, New York.

207. Willing, George, M., *St. Louis, Missouri.*
Human footprint rudely sculptured on the surface of a sandstone rock, found in Jefferson county, Missouri, 30 miles south of St. Louis.

[This is one of a pair of impressions whose discovery some six years ago (viz. in 1847) gave rise to many vague and curious speculations. The slightest inspection of the impression, shows its artificial origin. Doubtless it was designed to commemorate some event of importance in the annals of the aboriginal inhabitants, whose sculptured rocks, and rude pictorial records, are found at many places in the valley of the Mississippi, in Mexico].

208. Andrews, E. H., *Charlotte, Mecklenburg county, North Carolina.*
Indian relics from North and South Carolina. Quartz pseudomorph of calcite and other minerals of North Carolina.

209. Swift, Dr. Edward, *Easton, Pennsylvania.*
Pig iron, crystallized in thin elastic plates, some coated with scales of artificial graphite; crystalline silicates in slags, from furnace at Easton.
A large collection of Indian relics, arrow heads, made of stone, etc., from Pennsylvania, Kentucky, and Ohio.
Stilbite and heulandite, from Iceland; quartz crystals, from Easton, Pennsylvania; chalcedony, from Iceland; chromic iron, from California; fossil wood, from California; semi-opal, from California.

[The owner of this collection of Indian arrow points is very desirous of increasing it as much as possible, and feels that he may ask the aid of all who may be able to contribute any specimens to it].

210. Hall, Professor James, *Albany, New York.*
A chart of the successive geological formations, with an actual geological section, from the Atlantic to the Pacific Ocean; the whole illustrated by the characteristic fossils of each formation.

211. Marcou, Jules.
A geological map of the United States and the British Provinces in North America.

GREAT BRITAIN AND IRELAND.

Carbonaceous and Ferriferous Minerals and Products.

212. Bolcklow & Vaughan, *Middlesbro'-on-Tees, Yorkshire.*—Producers and Manufacturers.
Specimens of ironstone from Cleveland, Yorkshire, of superior quality, yielding thirty-three to forty per cent. of iron; the bed is from ten to fifteen feet thick. The same, calcined.
Woodfield main coal, remarkably free from sulphur.
Woodfield ground fire-clay, coke, and fire-brick.
Mountain limestone (flux).
Specimens of slags from blast-furnace at Middlesbro' Iron Works.
A large variety of specimens of iron from the same Works.—Railway bars, window-sash bars, locomotive tires, pig iron, &c.

213. Weardale Iron Company, *Weardale, England.*—Producers. (Agent, Charles Atwood.)
Iron ores from the Company's mines.

[This Company holds all the iron mines, speaking generally, in Weardale, a valley extending westward from Darlington, where there is a railway station, about twenty-five miles, and of an average width of, perhaps, eight miles. The geological formation is the mountain or carboniferous limestone. It contains several workable beds of coal, say three to five feet thick, but throughout almost the whole of Weardale these beds are confined to two minute seams of earthy and sulphureous coal, of from two to seven or eight inches thick (provincially called "crow coal"), though in some places these thicken to from three to four feet, and are at such places somewhat better in point of quality, and good enough to be used by the scattered population in the want of wood, as better fuel than their peat beds yield. Twenty miles further to the north than Weardale, the limestone beds become split into a greater number, and grow thinner, and good workable beds of coal, of two to five feet thick, become regularly interstratified with them for, perhaps, thirty miles further to the north; and the other beds which the stratification comprises in this district, consist of a succession of sandstone beds and bituminous slate clay, the former marked by no peculiar characteristics, and the latter locally called "plate," from its slaty disposition in plates or sheets, uniformly accompanying the limestone and the sandstone rocks.

There is only one other bed in the system, and that is a very peculiar, and, in a geological point of view, a most important one. It consists of a stratified mass, or bed of basalt, which may be seen, forming cliffs and causing waterfalls, along the course of the River Tees (which pursues a course parallel to that of the Wear, and about ten miles to the south of it), from near Middleton, Teasdale, to the river's source; lies under the whole of Weardale, under the whole of Derwent Dale, the two dales called Allendale, and the dale of the Tyne, to the north of Weardale, and may be seen emerging to the day, a few miles northward of the Tyne, for the length of above ten miles, in columnar cliffs, regularly and conformably disposed in the same position, as regards the limestone, sandstone, plate, and coal beds, opposite to, and from a point about as far east as the Haydon Bridge, to near the watering-place of Gilsland, westward, the summit of the ridge itself having been taken by the Romans, as the line of their fortress and wall, between the mouth of the Tyne and the Solway Frith. As far as the mining operations have extended, in the mineral veins of the formation which traverse the basalt, without destruction, exactly as they do the superjacent and subjacent rocks of limestone, plate, and sandstone, affording the same metallic minerals, which are chiefly lead and iron in such, it occupies the same position, and appears as uniform as they are in respect of thickness; and though, from its extreme hardness, and the veins being usually compressed in it, they have not been generally much worked in it, yet, in some cases, they both have been, and still are; and, in one case, within the last three months, the managers of the lead mines of Wentworth Blackett Beaumont, Esq., M. P. (who has all the mines of lead in Weardale and in the two Allendales, and works them most expensively), have completed a task of several years' duration, in sinking regularly through it, at a lead mine called Burtree Ford, finding it just 40 fathoms, or 240 feet thick, and the rocks below as regular and little altered as above it. It may be as well to mention that this same formation (the mountain limestone formation) extends southward, through the west of Yorkshire, to the south of Derbyshire; that the above mentioned basaltic bed appears to accompany it, as a subordinate rock, all the way, or, at any rate, prevails in it through Derbyshire, where, however, it changes its appearance, passing, from a compact crystalline basalt, into a decomposed and softer bed, there called "toad stone," while the limestone rocks, which are here split into twelve or fourteen separate beds, divided by beds of sandstone, slate clay, &c., as already mentioned, are united, in Derbyshire, into one or two only, whose total thickness exceeds, by more than double, the total thickness of the total greater number here.

From the spot in which these iron works are situated (the Tow Lane Railway being in the midst of them) the formation, for about thirty miles westward, is this mountain limestone; and as far eastward, to the sea, it is entirely a superjacent coal formation, the lowest bed of coal in the Newcastle and Durham series, which have a rise for the whole distance from the sea, coming to the day at this spot, which is the junction-point between them. The whole of the mountain limestone formation is traversed by mineral veins, containing copper, zinc, lead, and iron, the two latter metals being by far the most considerable, the lead belonging to (and being wrought by Mr. Beaumont), the iron to this Company; but the two metals occurring sometimes in the same veins, both are in such cases worked by the latter, under an arrangement with that gentleman.

The lead mines, with those in the contiguous estates of Mr. Beaumont, in the two Allendales, and those also contiguous, of the Greenwich Hospital, in Alston Moor, form by far the most extensively wrought district of lead ore in this kingdom. The iron ore, which throughout the district, except in this central part of it, occurs in the four nodules of clay ironstone, diffused through the slate clay beds, exactly as in the coal fields of Wales and Staffordshire, is here, apparently by the action of the true mineral veins which everywhere intersect it, and are nearly vertical, collected, as it

were, into those veins, and where it lies, deeply hidden from the day, in the very unusual form of extremely pure crystallized or spathose carbonate of iron, the very best of iron ores, and yielding the least of iron. But wherever, from its depth, or from the access of the atmosphere, to which the shattered and cavernous condition of the veins affords admission, it has passed from that state, in most cases to the condition of brown hydrated peroxyd of iron, or brown hematite, by spontaneous decomposition; but where the ground is very dry, to that of red anhydrous peroxyd, or red hematite; and where the moisture is very great, the brown hematite has become softened to a sort of pitchy consistency, and diffused itself with the water into the contiguous rocks, forming a mechanical mixture of ore therewith, of course reduced in value, as being poorer and less fusible. The iron which the hematites afford is good, but never, however pure the ore, at all equal to that afforded by the spathose carbonate of iron, which has hitherto been found in workable quantity in no other mines in Britain, and being in this case closely contiguous to the best and cheapest iron-making coal in Britain, is of very great value, but in much less abundance than the hematite.]

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214. Hird, Dawson & Hardy, *Low Moor Iron Works, Bradford, Yorkshire.*—Manufacturers.

Specimens of best coal of the soft and hard kinds; coke, prepared by burning these coals in ovens, or in rows on the ground, to purify it from sulphur and other matters which would be injurious to the iron; it is used in the blast or smelting furnaces.

"Black bed coal," used for steam-engine boilers and house-fires, and coke made from it, used for lime-kilns, stoves for drying cores, for moulding castings, and other common purposes.

Black ironstone (two varieties), which lies immediately above the black-bed coal, is found in six distinct strata, and forms a bed of five feet in thickness, the whole being imbedded in shale; it contains about twenty-eight per cent. of iron, and seventy-three hundred weight produce one ton of metal.

White ironstone, which lies twenty-two yards above the black-bed coal, is found in seven strata, together seven feet thick, in shale, contains twenty-eight per cent. iron, but is inferior to the black ironstone.

Burnt ironstones, prepared by roasting in kilns or in heaps on the ground, to separate certain injurious matter; it is then taken to the blast furnaces to be smelted.

Limestone from Skipton, used as a flux for the ironstone; twenty-two hundred weight used per ton of iron.

Pig iron, of three qualities, used for different purposes.

Slag, from the smelting furnace, used for making roads.

Refined pig iron, prepared by exposing pig iron of the third quality in small low furnaces to a powerful blast. These furnaces are called refineries, and the refined metal, when run into moulds, is in the second state of manufacture.

Slag from the refinery furnace, containing from forty to fifty per cent. of iron, which may be extracted in the smelting furnace by the addition of a flux.

Puddled iron, which is iron in the next state of manufacture after the refined iron, being, to a certain extent, malleable and ductile.

Slag from the puddling-furnace.

Specimens of bar and rod iron, boiler-plate, iron rods tied into knots in the cold, showing the flexibility of the iron, and a specimen, the strength of which has been tested by hydraulic pressure in a cold state.

[This series of specimens and products was the most complete and systematic collection, illustrative of the iron manufacture, which was exhibited by any party, and highly instructive to the attentive observer.]

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215. Morgan, Richard, & Sons, *Llanelly, Wales.*—Producers.

Stone-coal, or anthracite, from Curn, Amman, Llanelly, Gelly Ceidrim. Ditto, polished.

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216. Abercarn and Gwythen Collieries Company, *Newport, Monmouthshire, Wales.*—Producers.

The Gwythen charcoal-vein steam coal.

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217. The Executors of Robert Couldwell Clarke, *Old Silkstone Colliery, near Barnsley, Yorkshire.*

Iridescent, or "peacock" coal.

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218. Cameron's Coalbrook Steam Coal Company, *London.*—Producers.

Smokeless steam coal (of a quality intermediate between bituminous and anthracite), from the mines near Longhor, in the county of Glamorgan, South Wales.

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219. Davis, D., *Hirwain, near Merthyr Tydvil, Wales.*—Producer.

The Blaengwaur steam coal, from Aberdare.

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220. Gilmour, A., & Co., *Kilmarnock, Scotland.*—Producers.

Steam coal, from Hurlford and Skerrington Colliery, near Kilmarnock.

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221. Ramsay, G. H., *Derwent Haugh, Newcastle.*—Producer.

Cannel coal from the well-known Ramsay vein.

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222. Harrison, Ainslie, & Co., *Newland Furnace, Ulverstone.*—Producers.

Hematite iron ore (specular iron) from Lindal Moor, in Furness, containing 66·47 per cent. of iron, with a little oxyd of zinc and silica.

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223. Ulverston Mining Company, *Stainton, England.*—Producers.

Furness iron ore (hematite), produced from mines belonging to the Earl of Burlington, and used in Staffordshire, Yorkshire, and South Wales, for mixing with inferior iron ores.

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224. Monkland Iron and Steel Company.—Manufacturers. (Agent, William Murray, *Glasgow.*)

Iron ore, malleable iron, and fire-clay.

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225. The Bowling Iron Company, *Bradford, Yorkshire.*—Manufacturers.

Specimen of coke, coal, oven-coke, boiler-plate cuttings, puddled iron, iron ore, calcined ore, bar iron for tires, refined iron, three qualities of pig iron, and a knot of iron tied in the cold.

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226. Seyssel Asphalte Company, *Stangate, Westminster Bridge, London.*

Raw asphaltum and samples illustrating various applications of it, such as asphaltum for paving, for roofing, etc.; mineral tar, and grit.

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227. Wolff & Son, *Church Street, Spitalfields.*—Manufacturers.

Cumberland graphite, in crude state, and prepared by purification and compression. *Creta levis* of different colors, and pencils made from it.

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228. Brockedon, W., *London.*

Graphite from Cumberland, in its crude state, and purified and condensed into blocks by a pressure of 5,000 tons.

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229. The Patent Fuel Company, *London.*—Manufacturers.

Warlich's Patent Fuel.

[Warlich's patent fuel consists of bricks made by compressing, with an hydraulic press, dust of coal made coherent by bituminous matter, and partly charred. These bricks measure 9 by 6½ and 5 inches, are dense, and require breaking before using. They burn with but little smoke and form an excellent fuel, particularly where economy of room is an object, as it can be stowed very compactly. Hitherto we believe no important use has been made of the dust coal of our anthracite regions. By similar treatment every pound of it might be saved with a good profit to the manufacturer].

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230. Naylor, Vickers & Co., *Sheffield.*—Manufacturers.

Specimens of cast steel for saws, tools, etc.

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231. Johnston, Cammell & Co., *Sheffield.*—Manufacturers.

Specimens of cast steel, including best doubly carbonized and refined cast steel for chisels, for taps, and other tools; highly carbonized double shear steel, warranted extra superior; prepared elastic spring steel, and three varieties of superior extra refined cast-steel, for engineers' and machinists' tools.

Ores of Common Metal.

232. The Mining Company of Ireland, *Dublin.*—Producers.

Large masses of yellow copper pyrites, from Knockmahon mines, Waterford county, Ireland.

Lead ores, from Wicklow mines. Specimens of lead, in pigs, sheets, pipes, and shot, from the Ballycomer smelting works, Dublin county.

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233. Byers, J., *Stockton-on-Tees*—Manufacturer.

Argentiferous galena, and specimen of pure silver extracted from it; argentiferous galena and quartz; litharge.

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234. Seccombe, Samuel, *Phœnix Mines, Liskeard, Cornwall.*—Producer.

Specimens of tin and copper ore.

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235. Devon Great Consolidated Copper Mining Company, *Devon.*—Producers.

Copper ore.

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236. Vivian & Sons, *Haford Copper Works, Swansea, Wales.*

Series of specimens illustrating the smelting of copper, including the raw and calcined ore, crude metal from ore furnace, slag from ore furnace, calcined ore-furnace metal, white metal from melting, slag from ditto, blistered copper, slag from ditto, refined copper, and slag from ditto.

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237. Buccleuch, The Duke of, *Wanlock, Lead Hills, Dumfriesshire, Scotland.*—Proprietor.

Samples illustrating the process of Pattinson for separating silver from argentiferous lead.

Specimen of massive argentiferous galena, from the Wanlockhead mines.

Pig of unrefined lead, containing 7 oz. 9 dwts. 8 grs. of silver per ton.

Pig of refined lead, containing 12 pennyweights of silver per ton.

Condensed fume, from Wanlockhead lead works, (a lead gray, not very heavy, powder).

Lead obtained from condensed fume, containing 1 oz. 9 dwts. 20 grs. of silver per ton.

Washed ore (pure galena).

Roasted ore.

Crystals of lead, obtained in Pattinson's desilvering process.

Litharge.

Mass of pure silver weighing 437 ounces, obtained from the lead of the Wanlockhead mines, by Pattinson's desilvering process.

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238. Grey, John, *Dilston, Cambridge.*

Blende ore, from Alston Moor, Cumberland.

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239. Rowe, Richard, *Laxey Glen, Douglas, Isle of Man.*—Producer.

Blende ore and argentiferous galena, produced from the Laxey mines, Laxey Glen, parish of Lonan, Isle of Man.

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240. Breadalbane, The Marquis of, *Taymouth, Aberfeldy, Perth.*—Producer.

Specimens of granite, porphyry, lead ore, and argentiferous lead ore.

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241. Barrett, Captain, *Coniston, near Kendal, Lancashire.*—Producer.

Cobalt ore, from the Coniston mines.

Building and Architectural Stones and Minerals, otherwise useful, or of scientific interest.

242. Champernowne, H., *Darlington House, Totness, Devon.*—Producer.
Polished madrepore marble.

243. The London & Penzance Serpentine Company, *Penzance, Cornwall.*—Producers.
Polished serpentine, from Lizard, Penzance.

244. Lomas, John, *Bakewell, Derbyshire.*—Producer.
Polished Derbyshire marble.

245. Vandeleur, George, *Limerick, Ireland.*—Producer.
Variegated marble (polished slab), from Ballynamona, near Hospital and Knocklong station, county Limerick; sand from Limerick.

246. —— ——
Slate, from Bradford, county Clare, Ireland.

247. Webb, George, *New York City.*—Agent.
Specimen of light brown sandstone, from Ireland, called "Malone sandstone."

248. Wilson, Sir Thomas Marion, Bart., *Charlton, Kent.*—Producer.
Sandstone for foundations of buildings; varieties of sand, white for glass making, strong and mild Blackfoot for iron castings, red for ditto, sand for brass and cock founders, for brass castings, for silver castings, yellow loam for casting, strong brown loam for gas and other furnaces, masons' sand for stone sawing, coring sand.

249. Greaves, John W., *Port Madoc, Carnarvon, Wales.*—Producer.
Slab of slate.

250. Welsh Slate Company, *Festiniog, Merionethshire, Wales.*—Producers.
Slab of roofing slate.

251. Greaves, R., *Warwick.*—Manufacturer.
Blue lias stone, and cement made from it; specimens of Portland and Roman cement.

252. Francis, Charles, & Sons, *Nine Elms, Vauxhall, London.*—Manufacturers.
Parian cement, in the hard and soft states.

253. Stevens & Son, *London.*—Manufacturers.
Specimens of Martin cement, in the soft and hard states.

254. White, John Bazley & Sons, *Westminster.*—Manufacturers.
Roman cement; Keene's cement, two varieties? Atkinsons's cement, and Portland cement.

255. King & Co., *Stourbridge, England.*—Producers.
Fire clay, in its raw state, used in the manufacture of glass-house pots; peculiar to the Stourbridge district.

256. Gawkroger & Hyman, *Finsbury, London.*—Producers.
Fullers' earth, of three qualities, used in the manufacture of cloth made of animal fiber.

257. Squire, John & William, *Yarmouth, Isle of Wight, Hampshire.*—Producers.
Fine white sand, used in the manufacture of the best flint glass.

258. Lee, John, LL. D., *Hartwell, near Aylesbury.*—Proprietor.
Sand for glass making.

259. Collinson, Charles, *Mansfield.*—Producer.
Red casting sand, used in the production of fine castings.

260. Relf, S., *Reigate, Surrey.*—Producer.
Silver sand, from the tunnel caves at Reigate.

261. Worthington, William, *Northwich, Cheshire.*—Proprietor.
Varieties of salt. Fine, flaky, butter, common unstoved, extra coarse common unstoved, middle-grain, stove-dried, and fine table salt.

262. British Salt Company, *Liverpool.*—Manufacturers. (Agent, Wm. McCulloch.)
Rock-salt; coarse crude, and refined salt.

263. Damon, Robert, *Dorsetshire, England.*
Fluor spar and specimens of fossils, chiefly from the lias and cretaceous depoaits, many of them extremely fine.

264. Cowper, John, (Walton & Cowper) *Alston, Cumberland, England.*—Proprietor.
Aitherite and an immense crystal of heavy spar, weighing 112 pounds avoirdupoise, and very perfectly finished. It is believed to be the largest on record. This is the same specimen that was on exhibition in London in 1851.

265. Tennant, James, *London.*—Proprietor.
A collection of minerals and geological specimens.
A youths' mineral cabinet.
A set of the well known Sopurths geological models, constructed of various colored wood, and designed to convey to the geological pupil a clearer idea of the attenuation, upheaval and faults of local strata, than can be obtained from drawings. They are copied from actual surveys of some of the coal fields in northern England.

266. De La Beche, Sir Henry, *London.*
Geological maps and sections from the Geological Survey Office, England.

["The Jury take pleasure in noticing the geological maps, plans, and sections, from the Geological Office, London, Sir H. De La Beche, Director. They believe that these admirable maps are too well known to need any description, and that no award of theirs can affect their value and importance, or enhance the estimation in which they are justly held by all scientific men. If it be intended by the Commissioners that awards be made by the Jurors in cases of this kind, then they have no hesitation in recommending the award of the silver medal, with an expression of their high appreciation of the value and beauty of these maps."—(*MSS. Jury Report, Class I.*)

The Jury add:—"It was to have been expected that something in the way of geological maps would have been contributed from the numerous surveys in the United States, but nothing has appeared in the Exhibition, nor from any source have maps been contributed which add to our previous knowledge of the geology of the United States."

"A chart of the succession of geological formations, illustrated by figures of fossils, &c., by James Hall, and intended for instruction in geology and palaeontolgy, was exhibited at the request of the Director of this Department, and not with a view to competition, from which it would have been precluded in any event by the circumstance of the author's being a juror in this class."]

267. Hall, Elias, *Derbyshire, England.*
A mineralogical and geological map of the coal field of Lancashire, with parts of Yorkshire, Cheshire, and Derbyshire, England.

BRITISH COLONIES.

268. Albion Mines, *Pictou, Nova Scotia.*—Producers.
Specimens of minerals from the Albion Mines, and the neighboring district, with a section of the "main coal" of the Albion mine.
Twenty-one specimens from beds overlying main coal.
Seven specimens from Dalhousie pits.
Twenty-three specimens from sundry places.
Ten specimens from Albion Mines, "deep seam."
Gray freestone from Acadia quarry.
Brown freestone from Acadia quarry.

Section of the entire thickness of the "main coal," of Albion Mines:—

Numbers.	Thickness. Feet.	Inches.
1. Roof shale, containing spinorbis and vegetable fragments		3.
2. Coal, with bands of carbonaceous-shale		6¼.
3. Coal laminated with bands of bright coal and mineral charcoal; in the bottom, a layer of small ironstone concretions	2.	
4. Coal, fine cubical and laminated, containing much mineral charcoal	3	2.
5. Carbonaceous shale and ironstone, with a layer of coarse coal (called "holing stone"), contains remains of fishes		4¼.
6. Coal, laminated and cubical, contains mineral charcoal	9	3.
7. Ironstone and carbonaceous shale, with coaly layers and prostrate trunks of lepidodendrons, ulodendrons, sigillariæ, and stigmariæ		8.
8. Coal, as before, a line of ironstones at bottom	1	2.
9. Coal, as before, with a few small ironstone concretions. In this and the underlying coal, many minute smooth-pointed spines occur	6	7.
10. Ironstone and pyrites		3.
11. Coal, as before	10	3.
12. Coarse coal, with bituminous shale and pyrites	1.	
13. Coal, laminated and cubical, with a layer of pyrites at the bottom, with apparently fossil-trees	2	1.
14. Coal, as before, with layers of shale, passing gradually into under-clay	2	3.
15. Black under-clay, with slickenslides, coaly bands, and obscure traces of roots		10.
Total	40	8.

The above measurements are perpendicular to the horizon, the dip of the coal being about 20° north and 42° east.

269. Sydney Mines, *Cape Breton.* (Agent, Richard Brown).—Producers.
Block of bituminous coal, from Sydney mines; slab of flagging stone, from a neighboring quarry; blocks of ayenite, porphyry, and gypsum; specimens of fossil coal plants.

270. Steadman, J. & J., *Albert county, New Brunswick.*—Producers.
Specimens of manganese ore.

271. Cooke & Smith, *New York City.*
"Albert coal," from the Albert mine in Hillsborough, Albert county, New Brunswick.
This is the material which has evoked so much controversy among geologists, chemists, and lawyers, as to whether it is coal or asphaltum. Its position is beyond doubt in the true coal formation, although this particular bed has been thrown into a vertical position, and irregularly compressed. The material is one of the most beauti-

ful of all carbonaceous products. It is jet black, brilliant and lustrous, with a conchoidal fracture, and extremely brittle. It yields about 20 per cent. of its weight to the action of solvents, the remainder presenting, after washing, the appearance of the original substance. It does not fuse, and softens only at or above 600°. It does not run when burned in the grate, and, in short, in no respect resembles asphaltum, save in its lustre and fracture. Its composition is—

Carbon (fixed at redness),	36·04
Volatile,	61·74
Ash,	2·22
	100·00
Coke,	38·26
Specific gravity,	1·13

[Compare this analysis with the one under No. 14].

FRANCE.

272. Eloffe, 10 *Rue de l'Ecole de Medecine, Paris.*—Proprietor.

A mineralogical collection containing about 800 specimens, from all parts of the world, the different species being represented by a great number of varieties, arranged according to the method of Brard.

273. Bonbée, M. Nérée, *Paris, France.*—Geologist.

1. A table of the materials of which the terrestrial globe is formed, arranged as a general and synoptic chart of geology, palæontology, and mineralogy, in their applications to agriculture and to industry in general; its object being to facilitate the study and demonstration of geology, and to illustrate the methods of searching for useful minerals.
2. A chart representing the mineral structure of the earth.
3. A chart representing the geological condition of the globe at various epochs.

THE GERMAN STATES.

274. The Royal Bavarian Director General of Mines.

An extensive and systematic collection of minerals and rocks, presenting a comprehensive view of all the mineral resources of Bavaria, admirably well prepared and catalogued.

["The Jury conceive this to be the most perfect collection of its kind in the exhibition, illustrating the mineral resources of a country in connection with its geology; and as such is entitled to the highest award."—*Manuscript Jury Report, Class I.*]

275. ——— ———

Specimens of pyrolusite in various forms, columnar, radiated, granular, with dog-tooth spar, mammillary, massive granular, etc.; several specimens of powdered pyrolusite, labelled "Branstein."

Brannite, in beautiful black octahedrons.

276. The Royal Saxon Mining Academy, *at Freiberg, in Saxony.*

A series of very large cabinet specimens, illustrating the mineral productions of Saxony, and a large collection of geological specimens of rocks, fossils, etc., from Saxony and other countries.

[Speaking of this noble collection, the Jury say, "This collection exhibits in great variety the ores, their mode of occurence in the vein, and the vein stone organgue. It illustrates by a great variety of rich, medium, and poor specimens, the character and produce of the veins or lodes viewed simply as illustrating the character of mining products, and specimens indicating the real mode of occurrence of the ore; this collection is of the highest interest; and as far as teaching by collections is to be considered, the Jury regard this as the most perfect example presented in the class, and would recommend the highest award.

"Both this and the preceding collection may be regarded as models of their kind which may be advantageously followed in the illustration of similar subjects."—*Manuscript Jury Report, Class I.*]

277. Ziervogel, William, Smelting Inspector at the Copper and Silver Mining and Smelting Works at *Mansfield, Prussian Saxony.*—Inventor.

Samples illustrating a new process for separating silver from copper in argentiferous ores containing sulphyd of copper.

No. 1. Specimen of the "kupferschiefer," or copper-slate of.
No. 2. Mass produced by first smelting of the ore.
No. 3. The same pulverized.
No. 4. No. 3 roasted.
No. 5. Residue after lixiviation.
No. 6. Crude copper from No. 5.
No. 7. Mass produced by fusion of No. 5.
No. 8. Refined copper.
No. 9. Refined copper.
No. 10. Slag from the refined copper.
No. 11 and 12. Precipitated silver.
No. 13. Silver fused into a lump.

[This would appear to be a process in which the silver is separated from the copper, in ores which contain the two metals in the form of sulphyds, by first roasting the mass, to convert a small portion of the sulphyds into sulphates, and then lixiviating the mass with water, which dissolves the silver in the form of sulphate of silver, together with a quantity of sulphate of copper. The silver is then precipitated from the argentiferous solution by means of metallic copper, which has the power of decomposing sulphate of silver, converting it into sulphate of copper, while the silver is thrown down in the metallic form as a coarse powder. The sulphate of copper in the solution is then decomposed in precisely the same way by metallic iron, which has the power of throwing down copper from its solution in the metallic form, sulphate of iron being formed. The mass left after the lixiviation, represented by sample No. 5, is also smelted in the usual way to obtain the copper left in it.]

278. Guttler, Wilhelm.

Specimen of auriferous mispickel, and a series of samples illustrating the process of Plattner for extracting gold from it; with a plan of the works where his process is practiced, at Reichenstein, Prussian Silesia.

279. Strauss, Charles M.

Specimens of lithographic stone, from Solenhofen, near Munich.

280. Schwartz, F. A.

Specimens of lithographic stone, from Solenhofen.

281. Haberlein, Carl, *Poppenheim, Bavaria.*—Proprietor.

Specimens of the Solenhofen lithographic stone, and a complete collection of the fossils found in the formation.

[This was a most beautiful suite of the Solenhofen fossils, very carefully prepared, and in the finest possible order.]

282. Krantz, Dr. A., *Bonn on the Rhine, Prussia.*—Proprietor.

A select suite of first-class and rare mineral specimens, from various foreign localities, embracing minerals from Prussia, from other parts of Germany, from Austria, from Switzerland, from Italy, from France, from Scandanavia, and from Russia; fossils from Germany, very select.

a. A systematic collection of 200 mineral specimens, 3 × 3 inches, designed for instruction of students.

b. A systematic collection of 200 rock specimens, 4 × 4 inches.

c. A systematic collection of 300 characteristic fossils, according to the various geological periods.

[These collections occupied a conspicuous position in the cabinet of the Exhibition, and attracted much well-deserved attention. As a proof of the utility of the Exhibition, it is proper to mention that a large number of these systematic collections were ordered by preceptors of schools and by students. The collection of 200 mineral species was particularly attractive, as well for the general excellence of the minerals, as for the very low price at which they were offered.]

TUSCANY.

283. Hall, Coppi & Sloane, *Florence, Tuscany.*—Producers.

Specimens of the copper ores and associated minerals from the exhibitors' mine at Montecatini, in Val di Cecina.

Specimens of the products of the smelting works at Briglia, near Prato.

[This is the richest copper mine in Tuscany, and has been wrought since 1827, with great activity and profit, yielding a large amount of copper annually. The ores are yellow and purple copper, with copper glance and native copper, fine masses of all of which, with cake and tile copper, were sent.]

284. Sloane, R. J., *Florence.*—Producer.

Cinnabar (sulphuret of mercury) from a tertiary (?) formation, accidentally discovered two years ago, at Jano, a small village, ten miles north of Vollena, in Tuscany.

[The mine is worked by a Company, with a capital of £22,000, in 550 shares of £40 each. The mineral is abundant, and easily raised. It does not average more than twenty per cent. produce.]

SWEDEN.

285. Directors of the Public Iron Depot, at *Gothenburg, Sweden.*

Specimens of iron ore (magnetite), and varieties of iron and steel made from them.

HOLLAND.

286. Bleckrode, S., *Delft, South Holland, Netherlands.*—Inventor.(?)

Specimens of tin ore (cassiterite), washed out by the Chinese at Banca. Samples of metallic tin in pigs and bars, smelted by steam-blast from the ore; and specimens of slag.

CUBA.

287. New Society of Mines, *Havana, Cuba.*—Producers. (Agents, Robert & Williams, *New York.*)

Copper ore, from Holguin, Cuba.

REPORT ON THE IRON AND COAL OF PENNSYLVANIA.

By Dr. Charles M. Wetherill.

The extensive series of ores and furnace-products of this State was collected at the expense of the Association, and under the direction of Dr. Charles M. Wetherill, of Philadelphia, who visited for the purpose the several localities mentioned in the following pages. The collection is quite extensive, numbering about one thousand specimens, and weighing over two thousand pounds. It is believed that it presents an accurate view of the different varieties of ores and furnace-products of a State so important for its manufactures of iron. It embraces the various ores in use at the fifty-four different furnaces, together with their several fluxes, slags, fuel, and pig-metal (and in some instances wrought-metal), through every stage of the process, from the crude ore to the manufactured article. It would, no doubt, have been desirable to have had a representation from every furnace in the State, but experience proved, that a simple request through circulars, however urgent, was insufficient to obtain the specimens, and as the space to be traveled over was very extensive, it was important to lay down a route which would permit us to assemble, in a moderate time, at least the types of the different varieties of the manufacture. For this purpose much assistance and valuable information were afforded by the kindness of Charles E. Smith, Esq., who traveled over the State in 1849 to obtain statistics for the Convention of Iron Masters, and from whose Report the accompanying table has been compiled, to illustrate the furnaces which have contributed to this department of the New York Exhibition:—

STATISTICAL TABLE OF THE FURNACES MENTIONED IN THIS ARTICLE.

(From Charles E. Smith's Statistics of the Pennsylvania Iron Manufacture. 1850.)

Name of Furnace.	Date of Construction.	Situation. (Post Office.)	County.	Owners or Lessees.	Kind of Furnace.	Largest Product. Tons.	Actual Make. 1849. Tons.	Number of Men and Boys Employed.	No. Oxen, Horses and Mules Employed.	BLAST. Heat.	Tuyeres. No.	Tuyeres. Diameter.	BLAST. Pressure.	STOCK. Bosh. Feet.	STOCK. Height. Feet.	Kind of Power Used.	Kind of Metal Made and Number.	Annual Capacity. Tons.
Mount Laurel...	1836	near Reading.....	Berks.....	W. H. Clymer & Co.....	Charcoal ..	850	450	40	40	Cold	1	2		7½	30	Water	1, 2, 3,	1,550
Moselem	1816	Moselem	Berks.....	F. S. Hunter.....	"	1,200	1,200	60	54	"	1	2		8,9	32	"	2, 3,	1,350
Carbon	1838	Manch Chunk.....	Carbon	J. Richards & Sons.....	Anthracite	1,500	1,500	53	8	500°	3	3	3	8½	34	"	1, 2,	2,000
E. Pennsylvania*	1837	E. Pennsylvania...	Carbon	S. Balliet & Co.....	Charcoal ..	780	624	61	55	500°	1	2½		7	30	"	1,	1,000
Lehigh.....	1826	North Whitehall...	Lehigh.....	"	"	1,430	1,204	90	60	"	1	2¾		7½	31	"	1,	1,200
Crane, 1.....	1840	Catasauqua.....	"	Lehigh Crane Iron Company.	Anthracite	3,958	3,639			612°	3	3	4	11	45	"	1, 2,	4,000
" 2.....	1842	"	"	"	"	4,833	4,494	500	300	"	4	"	"	13	"	"	"	5,000
" 3.....	1846	"	"	"	"	7,144	6,139			"	6	"	"	17	"	Steam	"	7,200
" 4.....	1850	"	"	"	"					"	7	"	"	18	40	"	"	8,000
" 5.....	1850	"	"	"	"					"	"	"	"	"	"	"	"	"
Allentown, 1....	1846	Allentown	"	D. E. Wilson & Co.....	"	5,000	4,200	200	250	"	3	2¾	2½ to 3	12	35	"	"	5,000
" 2....	1847	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
Hopewell	1759	Douglassville.....	Berks.....	Brooke, Buckley & Co.....	Charcoal ..	1,150	1,000	80	50	Cold	1		¾	6½	30	Water	1,	1,150
Joanna.....	1793	Joanna	"	Darling & Smith.....	"	1,050	1,050	50	30	"	"			7,6	31	"	2, 3,	1,050
Henry Clay	1846	Reading.....	"	Eckert & Brothers.....	Anthracite	3,484	3,250	50	35	500°	3	3	3 @ 4	14	37	Steam	1,	3,500
Iron Dale.....	1845	Bloomsburg.....	Columbia	Bloomsburg Iron Company..	"	10,200	8,132	180	80	550°	3	3¾	2½	14	35	Water	2, 3,	10,200
Montour, 1‡.....	1838	Danville	Montour.....	Montour Iron Company.....	"	3,135		70	5	612°	3	2¾	4	9	31	Steam	3.	3,150
" 2	1839	"	"	"	"	4,042		"	"	"	3	"	4½	12	33	"	"	4,100
" 3	1839	"	"	"	"	3,523	1,953	"	"	"	"	"	"	"	"	"	"	"
" 4	1846	"	"	"	"	6,449	6,449	"	"	"	4	"	4½	14	34	"	"	6,500
Chulasky.....	1846	Red Point.....	Northumberland	S. R. Wood.....	"	4,000	3,500	65	50	"	3	4	3½	"	"	"	2, 3,	4,500
Ralston	1837	Ralston	Lycoming.....	Lycom. Valley Iron Company	Charcoal ..	1,000		44	37	600°	3	3½		10	35	Water	2,	2,000
Mill Hall.....	1830	Mill Hall.....	Clinton	Wharton, Morris & Co.....	"	1,360	1,360	70	45	Hot	2	4		8½	28	"	2, 3,	1,600
Logan*†	1800	Bellefonte.....	Center	Valentine & Thomas.....	"	1,320	1,320	40	36	Cold	1	3	½	8	31	"	3,	1,320
Eagle*†	1848	Milesburg	"	C. & J. Curtin.....	"	800	800	80	45	"	2	2½		8	30	"	3,	1,100
Howard*†	1830	Howard.....	"	Irwin, Thomas & Co.....	"	1,400	1,400	50	30	"	1	2½		8½	33	"	"	1,400
Pennsylvania* ..	1813	Baileysville	Huntingdon	Lyon, Shorl & Co.....	"	2,309	1,792	120	50	"	"	"		"	35	"	"	2,310
Huntingdon.....	1796	Warriors Mark....	"	George K. Schoenberger	"	1,650	1,100	130	50	Hot	"	"		"	33	"	"	1,650
Alleghany.....	1811	Hollidaysburg	Blair	Elias Baker.....	"	1,751	1,062	80	60	"	2	2¼		9	32	"	1, 2, 3,	1,800
Springfield.....	1815	Springfield Furnace	"	D. Good & Co.....	"	1,820	1,560	"	50	"	"			8	30	"	3,	1,820
Johnstown.....		Johnstown	Cambria	Ray, Matthew & Co.....	"					"				10	40	Steam		
Conemaugh	1847	Armagh	Westmoreland ..	"	"	800	600	60	30	"	2			"	"	"	3,	1,800
Cambria	1842	Johnstown	Cambria	Cambria Iron Company.....	"	1,300	820	90	45	Cold	2			8	30	"	3,	1,300
Black Lick.....	1846	"	Indiana	"	"	1,000	756	80	46	Hot	1			8	30	Water	2, 3,	1,400
Mill Creek	1845	"	Cambria	"	"	1,050	840	"	38	Cold	"			"	"	"	3,	1,100
Ben's Creek	1846	"	"	"	"	1,080	1,080	00	35	Hot	2			9	30	"	2, 3,	1,800
Pike.....	1845	Clarisville	Clarion	Doff & Co.....	"	1,000	830	77	53	Cold	1			8,6		Steam	3,	1,350
Winfield	1848	Butler	Butler	Wm. L. Spear.....	"	1,400	1,400	100	70	"	2			9		"	3,	1,400
Fairchance†	1796	Uniontown	Fayette	F. H. Oliphant & Son.....	"	800	600	48	25	"	1			9	36	S.&W.	2, 3,	1,400
Harrisburg	1845	Harrisburg	Dauphin	D. R. Porter.... :	Anthracite	3,614	3,360	71	48	612°	3	3½	3¾	12	35	Steam	1, 2,	3,800
Henry Clay	1845	Columbia	Lancaster	John Haldeman.....	"	2,678	2,150	50	36	"	"	3½	2¾	9	"	"	"	2,800
Chickiswalungo .	1846	"	"	E. Haldeman & Co.....	"	2,464	1,500	45	40	"	"	3	2½	8	32	"	1, 2, 3,	2,500
Donegal.....	1847	"	"	Eckert & Stein.....	"	3,472	3,472	46	44	"	"	"	4	10	35	"	"	8,800
Marietta	1849	"	"	Schoenberger & Musselman..	"	3,763	3,763	58	45	"	"	3½	3½	10	33	"	"	"
"	1850	"	"	"	"					"	"	"	"	"	"	"	"	"
Safe Harbor‡....	1848	Safe Harbor	"	Reeves, Abbott & Co.....	"	2,879	2,879	100	34	450°	6	3½	3¾	14	45	"	3,	5,000
Conowingo.....	1809	Bock	"	Jas. M. Hopkins.....	Charcoal ..	1,300	870	100	75	212°	1	3		7½	30	S.&W.	1, 2,	1,200
Phœnix, 1‡....	1845	Phœnixville	Chester	Reeves, Buck & Co.....	Anthracite		1,534			612°	3	3	4	12	38	Steam	2, 3,	4,100
" 2		"	"	"	"	3,910	3,910	371	114	"	"	"	"	"	"	"	"	"
" 3	1847	"	"	"	"	4,718	2,581			"	"	"	"	14	"	"	"	5,000
Spring Mill	1844	Conshohocken	Montgomery	D. Reeves.....	"	4,000		100	40	"	"	"	"	12	40	"	3, 4,	4,000
Plymouth.....	1845	"	"	S. Calwell & Co.....	"	3,338	2,492	185	40	"	"	"	3	11	36	"	1, 2,	3,850
Merion.....	1848	"	"	"	"	3,174	3,174	120	40	"	"	"	3¼	14	38	"	"	8,500
Sweda	1850	near Norristown...	"	Swede Iron Company.....	"			110	20	"	6	2½	4	"	42	"	"	4,000

* Charcoal forge at same works. † Rolling-mills at same works. ‡ Rail-mills at same works.

The fine collection of coals from Schuylkill county, which occupies a place in this portion of the cabinet of minerals, together with the table of statistics accompanying the same, was made (also at the expense of the Association) by Col. J. M. Wetherill and C. W. Peale, of Pottsville. It is the more important since it is the first time that such extensive and reliable information of this coal county has been made public, and so well exemplified by illustrative specimens.

This collection has been arranged in the order in which it was gathered. Since furnaces for the most part use materials in their immediate vicinity, a description in this order will group the furnaces using similar ores. This method will be pursued in the following pages.

The route adopted in crossing the State traversed the different formations as laid down in Professor H. D. Rogers' Six Geological Reports. As it will be convenient when treating the various ores of the collection, to refer to these formations, it will be well here to recall them by the following Table from Professor Rogers' Second Annual Report on the Geological Exploration of Pennsylvania:—

TABLE,

Showing the order of Stratification, Geographical Position, Composition, and the Maximum Thickness of the Lower Secondary Formations of Pennsylvania, East of the Susquehanna River.

From Rogers' Second Report.

Formations in the Ascending Order.	Geographical Position.	Usual Composition.	Maximum Thickness.
XIII.	Anthracite coal-basins.	Dark-blue shales, bluish-gray argillaceous sandstones, and coarse quartz ore; conglomerate and seams of anthracite coal.	6750 feet. Nearly at Pottsville. Not yet positively ascertained.
XII.	Sharp Mountain and the other mountain barriers of the anthracite coal-basin.	Coarse quartzose conglomerates, alternating with white and gray sandstone, and occasional thin beds of dark carbonaceous shale.	1400 feet. Tamaqua.
XI.	Surrounds the Mountain barriers of the anthracite coal-basins, usually in a narrow valley immediately outside them.	Red shales and soft argillaceous red sandstones, and occasional beds of compact silicious red and gray sandstones; also a few thin calcareous bands.	2949 feet. Mt. Carbon.
X.	Second Mountain, Peter's Mountain, Mahantango Mountain, Berry's Mountain, Line Mountain, Little Mountain, Cattawissa or Nescopeck Mountain, Wyoming Mountain, Shickshinny Mountain, and the south-eastern summit of Alleghany Mountains.	White and gray silicious sandstones, with dark-bluish and olive-colored slates; also coarse silicious conglomerates, alternating with gray, yellow, and white sandstones and bands of black carbonaceous slate, the latter sometimes erroneously taken for coal slate.	2400 feet. Very nearly Second Mountain.
IX.	Occupies the north-western part of Pike and Monroe, the eastern part of Wayne, all except the northern side of Susquehanna County, the whole south-east side and base of the Alleghany Mountains, and the base of the mountains consisting of Formation X., on the side remotest from the anthracite coal-basins.	Red shales and argillaceous red sandstones; also brown, gray, greenish, and buff-colored sandstones.	6000 feet or more. Below Mauch Chunk, Lehigh.
VIII.	Middle of the valley between Kittatinny and Second Mts.; Valley of Delaware River, from Water Gap to Carpenter's Point; middle of Roaring Creek Valley, North Branch, from Bloomsburg to Berwick; Muncy Hills.	Alternating strata of dark-gray, greenish, and olive-colored slates, and gray argillaceous sandstones. Contains many fossils. A stratum of blue fossiliferous limestone near the bottom of the formation.	5000 feet at least. Below Mauch Chunk.
VII.	The sharp rugged ridge next north of the Kittatinny Mountains.	A coarse and rather loosely cemented white and yellowish sandstone, with cavities showing the forms of shells and other organic remains.	700 feet. Susquehanna River, Dauphin County.
VI.	A very narrow belt occurring in places along the northern base of the Kittatinny Mountain, and thicker strata along both the northern and southern bases of Montour Ridge.	A blue argillaceous limestone, sometimes gray and sandy, and frequently very full of fossil shells, encrini, &c.	900 feet. Fishing Creek, Bloomsburg.
V.	Northern base of the Kittatinny Mountain, and on the sides and summit of Montour Ridge.	Red and variegated sandstones and shales. The lowest layers abound in several species of the marine-vegetable fossils called *fucoides*.	2000 feet at least. Delaware Water Gap.
IV.	Kittatinny or Blue Mountain.	Hard white and gray sandstones, and coarse marine-quartzose conglomerates. Contains impressions of several species of *fucoides*.	1886 feet. Lehigh Water Gap.
III.	Northern side of the Kittatinny Valley.	Dark fissile slates, usually blue, dark-gray, black and dingy, olive, and sometimes drab, yellow, and red. Contains also some beds of sandstone and a few conglomerates.	6000 feet at least. Delaware River, below the Water Gap.
II.	Southern side of the Kittatinny Valley.	A blue limestone, with their interposed layers of chert.	6000 feet; not yet ascertained, but probably as much as stated.
I.	Southern margin of the Kittatinny Valley, and northern side of the chain of hills called the South Mountain.	A very compact, rather fine-grained white and light-gray sandstone.	Not ascertained, but probably 1000 feet.

This group of strata, from the lowest sandstone which is in contact with the primary rocks of the South Mountain to the uppermost beds of the anthracite coal measures, is estimated by Professor Rogers as no less than forty thousand feet in thickness, and occupying the entire surface of the State, with the exception of the corner south-east of the South Mountain chain.

This south-eastern corner contains—

1st. The primary sedimentary or metamorphic rocks, gneiss, serpentine, marble, &c.

2d. Igneous or plutonic rocks, granite, syenite, trap rocks, &c.

3d. The secondary sedimentary rocks; which embrace Formations I., II., III., and in addition a formation of red shales, and red and gray sandstones and conglomerates, which series is posterior to the coal, and to which Rogers gives the name of "middle secondary strata, in contradistinction to the appalachian formations on the one hand, which are the lowest secondary formations, and the green sand deposits of New Jersey, &c., on the other, which are the uppermost secondary strata of our country."

1. The first furnace visited was *Mount Laurel*, W. H. Clymer & Co., *in Berks County*, about five miles distant from Reading. This is at present a cold-blast charcoal furnace, making a superior car-wheel iron. Annual product, 930 tons. The ores used are hematites from the Moselem Mines, and ore from Wheatfield, Cushing Hill, Cumru township, Berks County. The mines are on its boundary, between the sandstone I. and the red sandstone, and the ore is found in beds in serpentine, with irregular breccia on either side. It is a soft ore, mixed with magnetic oxyd and magnesian limestone. The harder ores are roasted and the charge is moistened. White, gray, and mottled pigs are made. The flux is from the limestone formation No. II.

On the road to the next furnace the Moselem Mines were visited, and specimens obtained. These mines are open excavations, the ore being imbedded in ferruginous clay, which rests upon the limestone of formation II. The ore occurs in nests in the clay, and large quantities have been taken from the mine, which supplies several furnaces, and more particularly the—

2. *Moselem Furnace of* N. V. R. Hunter. This is an anthracite furnace, using hematites from Moselem, Trexlertown, Breinigsville, and the magnetic ore from Wheatfield. Their flux is limestone from Kauffman's, in Formation II. At the time this furnace was visited it was on the point of being set in blast, or being "blown in." It was proposed to employ charcoal for some time, and subsequently to make use of anthracite. The slag obtained from this furnace was the product of a former blast by charcoal, and the pig-metal, from all Moselem ore, by anthracite.

The deposits of Trexlertown and Breinigsville are similar to that of Moselem. In all such cases, where the iron is contained in ferruginous clay beds upon the limestone, the richness of deposit appears to be in direct proportion to the thickness of the clay. Professor H. D. Rogers supposed all these deposits to have originated from the filtration of water through soil highly impregnated with peroxyd of iron, this soil having been an oceanic sediment, derived from the formations II. and III. The following is the composition of the Moselem ore (Rogers' Fourth Report) of the limestone formation II. Dark, dull brown, compact.

Peroxyd of iron	77·20	= 53·53 per centage of metallic iron.
Alumina	2·60	
Silica and insoluble	8·90	
Water	11·00	
	99·70	

Analysis of the Trexlertown ore, one mile west of Trexlertown, Lehigh County. (Rogers' Fourth Report, p. 179.)

Brown, compact, stalactitic, of the structure usually termed "pipe ore."

Peroxyd of iron	87·12	= 61·03 per centage of metallic iron.
Alumina	0·40	
Silica and insoluble	2·30	
Sulphur	a trace.	
Water	10·90	
	100·72	

Analysis of ore from Breinig's Farm, one mile north-west from Breinigsville, Lehigh County, in Formation II. (Rogers' Fifth Report, p. 112.)

Structure massive, quite compact, and close-grained. Color, blackish-brown; surface coated with a velvet-like oxyd.

Peroxyd of iron	75·54	= 52·87 per centage of metallic iron.
Alumina	trace.	
Silica and insoluble	11·90	
Water	12·15	
Loss	0·41	
	100·00	

All the furnaces of the neighborhood of Reading use limestone of the formation II. for their flux. Rogers has given a large number of analyses of limestone for this formation, the greater portion of which contain carbonate of magnesia, some in as high a proportion as 47 per cent.; magnesia to 50·8 per cent. carbonate lime. We quote the following analysis of a Berks County limestone from this formation. (Fifth Report, p. 162.)

Limestone from George Keim's quarry, Pike township.—Color, light bluish-gray; structure, somewhat laminated; texture, sub-crystalline; fracture, angular, contains in some parts small nodules of fluor-spar; the part analyzed, free from these, gave—

Carbonate of lime	88·34
" magnesia	7·80
Alumina and oxyd of iron	0·24
Insoluble	2·81
Water	0·80
Loss	0·01
	100·00

The following analysis of the Mauch Chunk coal is by Olmsted, from Taylor's Statistics of Coal.

Hard white ash. Sp. gr. 1·55.

Carbon	90·10
Water, hydrogen, and volatile matter	6·70
Ashes	3·30
	100·00

3. *The Carbon Furnace* (anthracite), *Carbon County*, J. Richards & Sons, is situated between the Canal and the Lehigh, half a mile below Mauch Chunk. An excellent iron is manufactured at this furnace, where the hematites of Breinigsville, Balliet's, and Freemansbury, are mixed with Cooper's magnetic oxyd from Jersey. The fuel is from the locality in the immediate neighborhood of the furnace. This analysis belongs to the description of the Carbon Furnace, Mauch Chunk.

The magnetic oyxd from New Jersey possesses, frequently, a very strong magnetic polarity. The analysis of the Breinigsville ore has been already given, and that of the ore from Balliet's mine will be treated of with the next furnace. The flux used at the Carbon Furnace is limestone from the Lehigh Valley (F. II.). Among the slags are found several that are partially crystalline.

The East Pennsylvania Furnace, near Lehighton, when visited, was not in blast, but was undergoing repairs. The ores at the furnace are the same as those used at the Lehigh Furnace (North Whitehall, Lehigh county), belonging to the same proprietors, S. Balliet & Co. From the latter locality, its selection of material was made. The Lehigh is a cold-blast charcoal furnace, using the hematite of Balliet's mine, which is designated black, gray, or red ore, according to its color. It is an ore of the limestone formation II., occurring like those ores of the same nature already described. Rogers (Fourth Report, pp. 178, 179,) gives the following analysis of this ore:—

Iron ore from Balliet's mine, five miles north-west from Allentown, Lehigh County.—Color, lime-brown, compact, superficial portion crystalline, radiated, and mammillary. The latter portion was selected for analysis.

Peroxyd of iron	83·22	= 57·61 per centage of metallic iron.
Alumina	0·21	
Silica and insoluble	4·81	
Water	12·40	
	99·64	

Another specimen of this ore—color, reddish brown; structure lamellar, compact—gave,

Peroxyd of iron	84·00	= 58·24 per centage of metallic iron.
Alumina	1·00	
Silica and insoluble	6·50	
Water	9·80	
	101·00	

The flux used is limestone of the Lehigh Valley, from the formation II. From this furnace was obtained a slag of a very rich light blue color, but which, though the only one obtained, is not the usual slag of the furnace.

4. *The Lehigh Crane Iron Company*, at Catasauqua, five miles above Allentown, is working five large-size anthracite furnaces, using fuel from the Lehigh region. These furnaces are advantageously situated upon the canal and river, and present an imposing appearance on the approach to Catasauqua. Every facility was afforded by their gentlemanly manager for obtaining a suite of average specimens of their raw materials and manufactured products. Their ores are the hematites of Lehigh Valley, and of Montgomery County, mixed with the magnetic oxyd from New Jersey. With regard to all of these deposits of hematite, which occur in ferruginous clay upon the limestone formation II. of the great Kittatinny valley, Professor Rogers has observed that, as a general rule, the largest and most numerous deposits are found on that half of the limestone which is nearest the South Mountain; a signal exception to this rule, however, being the rich ore beds lying about five miles to the north of Allentown, and on the west of the Lehigh; these beds are near the junction of the limestone with the slate formation III. The celebrated Moselem ore has a similar geological position with respect to formation III.

The following is the analysis of the above-mentioned ore, from Miller's mine, four miles north-west of Allentown, and west of Lehigh River (Rogers' Fourth Report, 178):—

Brown, stalactitic, variety "pipe-ore," the cavities partly filled with yellow pulverulent oxyd of iron.

Peroxyd of iron	86·59	= 60·04 per centage of metallic iron.
Alumina		a trace.
Silica and insoluble	3·08	
Water	11·31	
	100·98	

The following analyses are from Rogers' Fifth Report, pp. 110, 111:—

Iron ore from Richards, Lehigh County.—Structure, somewhat nodular, amorphous, color brown, coated externally with a yellow clay, in some parts blue. Average of the whole selected for analyses:

Peroxyd of iron	71·72	= 49·72 per centage of metallic iron.
Oxyd of manganese	10·42	
Alumina		a trace.
Silica and insoluble	4·12	
Water	13·21	
Loss	0·53	
	100·00	

From Moyer's, four miles north north-west from Allentown, Lehigh County, called lump ore.—Structure, compact, massive; color, dark chestnut brown.

Peroxyd of iron	72·17	= 50·51 per centage of metallic iron.
Alumina	1·50	
Oxyd of manganese		a trace.
Silica and insoluble	12·30	
Water	14·00	
Loss	0·03	
	100·00	

Pipe ore from same locality.—Irregularly stalactitic, pipes closely adhering, color rich chestnut brown.

Peroxyd of iron	79·21	= 55·44 per centage of metallic iron.
Alumina	0·75	
Manganese	none.	
Silica and insoluble	7·50	
Water	11·00	
Loss	0·54	
	100·00	

The following analysis of limestones used as a flux in the Lehigh Crane Iron Works, from Bierry's Bridge, on the Lehigh, three miles above Allentown, are given in Rogers' Fifth Report, p. 161:—

No. 1.—Color, grayish blue; texture compact, fine-grained, sub-crystalline; fracture, slightly conchoidal, angular.

Carbonate of lime	52·70
Alumina and iron oxyd	2·80
Insoluble	10·30
Water	0·42
	100·00

No. 2.—Color gray, texture distinctly crystalline and sparry, fracture irregular.

Carbonate of lime	93·40
Alumina and iron oxyd	1·80
Insoluble	4·30
Water	0·50
	100·00

From this furnace several specimens of slags were collected; those of a black and vitreous nature indicating an iron for the forge, and the grayish slag metal suitable for foundry purposes. There is also a specimen of blue slag, in which are crystals, and specimens of crystallized gray slags. The opportunity for obtaining crystalline slags at these furnaces is very good. The slags are run out into boxes or moulds, which are transported on trucks to the long cinder heap, which extends to a great distance both up and down the river. The cooling of the slags under these circumstances is conducive to the production of a crystalline structure, and the crystals found are sometimes very large. No care is taken to preserve them, however, as they appear to the workmen to be of "no use."

5. *The Allentown Iron Works*, D. E. Wilson & Co., are situated at *Allentown, Lehigh County*.—Two anthracite furnaces were in operation at the time of my visit, and a third of large size was in progress of construction. The ores in use here are the same as those at Catasauqua, viz., hematites, of the Lehigh Valley, and magnetic ores from New Jersey. The limestone is from the valley, and the coal is from the Lehigh anthracite region. I obtained from Mr. Wilson, the son of the principal partner, fine specimens of crystallized slags, as well as the interesting copper-colored cubes of the so called metallic titanium (Wöhler's double salt of titanium, with cyanogen and nitrogen), from a salamander extracted from one of the furnaces.

The furnaces in the southern part of Berks, and part of the mines in Chester counties, were next visited. The formation here is red sandstone (the middle secondary of Rogers), with hills principally of syenite, and at the southern point, the limestone formation II.

Messrs. E. & G. Brooke, proprietors of the Rolling Mill at Birdsboro', have presented a suite of twenty-nine specimens of minerals from their locality, and elsewhere, comprising ores from Pottsville, Reading, Yellow Springs, French Creek, Warwick and Jones.

COAL STATISTICS OF SCHUYLKILL COUNTY.

Specimens of Coal from the various Collieries in operation at present in the first Anthracite Coal Field of Pennsylvania, situated in Schuylkill County, with various Statistics appertaining to the same.

COLLECTED BY C. W. PEALE AND COL. J. M. WETHERILL, FOR THE WORLD'S FAIR AT NEW YORK, UNITED STATES OF AMERICA. (1853.)

General Division.	Colliery's Name.	Operator's Name.	Situate on the Lands Belonging to	No. of Specimen.	Name of Vein.	Thickness of Vein.	Color of Ashes.	Working Above or Below Water-Level.	Total Length of Gangway Driven.	Length of Tunnel Driven.	Depth of Slope or Shaft.	Steam Engines.	Steam Power used for: Hoisting Coal.	Pumping Water.	Breaking Coal.	Total Power.	Dip of Vein.	No. of Tons of Coal Shipped in 1852.	No. Hands Employed.	No. Horses.	No. Mules.	No. Houses for Miners.	Amount of Capital Invested.	Sundry Remarks.
						Feet.				Yds.	Yards.		horse	horse	horse	horse.							Dollars.	
SCHUYLKILL VALLEY.	Tuscarora	John Tucker	C. Stevenson & Co	1	Tuscarora	14	White	Below	1¾ miles.	110	115	2	60		20	80	South	39,818	75	7	7	20	45,000	Tunnel driving to Stapleton Vein.
				2	Grier	5	White	Below																
	Diamond	J. & R. Carter & Co.	C. Stevenson & Co	3	Jackson	8	Red	Below	100 yards	50	100	3	40	40	20	100	South	New	30			1	30,000	
	Locust Mountain	Alexander Sillymun	Kentucky Bank	4	Big Vein	20	White	Above	¼ mile	250		1			25	25	South	New	40	2	2		24,000	This is a new Colliery.
				5	Jackson	7	Red	Above																
	East Silver Hill	Charles J. Dobbins & Co.	Samuel Bell & Lee & Hart	6	Big Gate	8	Red	Above	1½ miles.	433		1			20	20	North	New	140	4	10	18	20,000	
				7	Little Gate	5½	Red	Above																
	United States	Sager Chadwick	Kentucky Bank	8	Peach Mountain	60	Red	Above	300 yards	25							N. & S.	4,268	20	2	3	6	6,000	Large body of Coal.
	Brockville	George H. Potts	John Brock & Co	9	Big Creek	3	White	Below	½ mile		160	2	50		20	70	South	22,532	100	3	3	60	57,000	
	Big Creek	Meyer & Silliman	S. Silliman & others	10	A	8	White	Above	1½ miles.		100	2	60		20	80	South	23,557	30	2	5	22	22,000	
				11	B	10	White	Above																
				12	C	8	White	Below																
	Milford	Samuel Silliman	Robb, Brooke & Winebrenner	13	Spohn	5	Red	Below	1½ miles.	500	100	2	60		25	85	South / North / North	7,717	60	3	5	26	32,000	
				14	Red Rock	2	Red	Above																
				15	Palmer	2	Red	Above																
	Middleport	Lawrence O'Brien	J. D. Meredith & Co	16	Big Gate	11	Red	Above	70 yards.								South	3,774	9	1	2		5,000	
	Lick Run	John Williams	Swalm, Audenried & Hughes	17	Peach Mountain	6	Red	Above	300 yards								South	1,220	16	3			2,000	
	Silver Creek	Henry Guiterman & Co.	Swalm, Audenried & Hughes	18	Ledger	9	White	Above	1½ miles.	150		1			10	10	South	23,075					16,000	
	Madison	James Thomas & Co.	Swalm, Audenried & Hughes	19	Big	25	White	Above	½ mile			2			35	35	South	1,256	30	3	7	22	31,000	
	Silver Creek	John Tucker	Swalm, Audenried & Hughes	20	North	10	White	Below	1 mile		150	3	60		40	100	South	26,084	250	6	14	30	50,000	
				21	South	40	White	Below																
	Black Heath	E. Dodson & Co.	Swalm, Audenried & Hughes	22	Black Heath	7	Red	Above	¾ mile			1			20	20	South	7,547	50	2	6	15	10,000	
				23	Little Bast	8½	Red	Above																
	Diamond	James Neal	Swalm, Audenried & Hughes	24	N. Diamond	5½	Red	Below	⅓ mile	58	110	2	50		30	80	South	20,149	80	7	5	18	35,000	
				25	S. Diamond	7	Red	Below																
	Fairview	Capewell & Dovey	Anspach & others	26	Gin	6	Red	Below	½ mile	30	60	2	25		15	40	South	1,197	60	6	2	22	16,000	
	Kaska William	Rogers, Sinnickson & Co.	Spayd, Luther & Brooke	27	Luther, No. 1	6	Red	Below	7 miles	880	90	4	150		50	200	South	72,690	250	13	23	100	100,000	Part of these Improvements are new this year.
				28	" No. 2	5	Red	Below																
				29	" No. 3	2	Red	Below																
				30	" No. 4	2	Red	Below																
				31	Black Valley	8	White	Above																
				32	Black Heath	3	White	Above																
				33	No. 2 Drift	4	Red	Above																
				34	Raven	20	White	Below			80						South / South							
	Do Long	Meyer & Silliman	W. L. Abbott & others	35	Big Vein	8	White	Above	1¼ miles.	300		1			15	15	South	17,383	50	1	5	40	2,000	
	Eagle Hill	Benj. Titus	Hewes & Baber	36	Gin	7	Red	Above	1 mile			1			20	20	N. & S.	7,274	25	4	4	25	17,000	
	Cumbola	W. Y. Agard & Co.	Bell & Hubley	37	Lewis	4	Red	Below	1 mile		230	3	60	35	15	110	South	17,843	100	2	3	30	35,000	
	Bellmont	W. Y. Agard & Co.	Samuel Bell	38	Spohn	4	Red	Below																
				39	Lewis	5	Red	Below	1 mile	230	353	5	120	40	25	185	South	22,897	150	12	6	58	70,000	This is a new Lift on old Slope.
				40	Spohn	4	Red	Below																
	Novelty	Connor & Roads	George Patterson & others	41	Spohn	4	Red	Below	1½ miles.	50	146													
				42	Palmer	3	Red	Below																
				43	Charles Pott	3	Red	Below			123	4	60	60	20	*160	South	30,697	80	13	1	66	50,000	
	Bear Ridge	J. C. Oliver	Shippen & Whitaker	44	Black Mine	3	Red	Below	1 mile	50	175	2	75		20	95	South	29,088	130	6	2	60	40,000	
				45	Tunnel	5	Red	Above																
	North Dale	Rogers, Sinnickson & Co	Rogers, Sinnickson & Co	46	Daniel	20	White	Above	1 mile	300		1			20	20	South	†					30,000	
				47	Hubley	8	White	Above																
	Lewis Tract	John J. Williams	Robert M. Lewis	48	Primrose	20	Red	Above	450 yards															
	Windy Harbor	Johanan Cockill	Swalm & Co	49	Big	28	White	Below									North	5,588	20	3	2	12	3,500	
	Mount Holly	Edward Callahan	Wetherill, Patterson & Kimber	50	Gate	7	Red	Below	450 yards		50	2	80	30	15	60	South	1,954	60	12	1	15	10,000	
				51	South Gate	4½	Red	Below				2	60			75	South		50	1	3	20	35,000	
MILL CREEK.	Mill Creek	Snyder & Milnes	Seltzinger & Wetherill	52	Spohn	7	Red	Below	1½ miles.	215	125	2	30		10	40	South	16,490	78	10	7	30	40,000	
				53	Yard	3	Red	Below																
	Mill Creek	George Mason & Co.	Seltzinger & Wetherill	54	Spohn	7	Red	Above	2½ miles.	206		1			20	20	South	18,587	104	2	5	18	16,000	
				55	Yard	3	Red	Above																
	Peacock	Lewis & Co.	Thomas Haven	56	Peacock	7	Red	Below	70 yards.		100	2	40		8	48	South	93	14	1			4,000	
	Rainbow	Kirk & Baum	Seltzinger, Wetherill & Keim	57	Big	30	White	Above	3¾ miles.	139		1			20	20	South	54,374	135	2	14	60	50,000	
				58	Seven Foot	7	White	Above																
				59	Skidmore	7	White	Above																
	Diamond	W. Littleheels	Carey & Hart	60	Diamond	4	Red	Above	¼ mile			1			20	20	South	7,969	50	2	2	2	3,000	Sinking new Slope 90 yards.
	Primrose	F. J. Parvin	Carey & Hart	61	Primrose	12	Red	A & B	1 mile			3	30	30	30	90	South	33,325	60	5	4		30,000	
	St. Clair	John Pinkerton	Seltzinger, Wetherill & Keim	62	Big	25	White	Above	5 miles	4		1			20	20	South	70,366	200	10	3	3	22,000	
				63	Seven Foot	7	White	Above																
	Carey	E. W. McGinness	Carey & Hart	64	Mammoth	25	White	Below	50 yards.		212	3	90		30	120	South	New	120	2		3	40,000	Perpendicular Shaft sinking.
	Pine Forest	Snyder & Milnes	Seltzinger, Wetherill & Keim	65	Mammoth	25	White	Below	3 miles		190	4	60	50	24	184	South	83,056	200	4	35	57	100,000	Two Slopes.
				66	Seven Foot	7	White	Below			280													
	Eagle	W. & Thomas Johns	Seltzinger, Wetherill & Keim	67	Big	30	White	Above	1½ miles.			3	90	50	20	160	South	57,045	100	4	11	40	50,000	New Slope sinking.
	Concordia	Osterman & Co	Seltzinger, Wetherill & Keim	68	Skidmore	5	White	Above	300 yards								South	3,170	18	1	1	3	2,500	
EAST NORWEGIAN.	Mammoth	Geo. S. Reppler	Pott & Bannan	69	Mammoth	18	White	Below	2 miles		160	3	60	30	15	105	N. & S.	56,572	125	3	4	27	50,000	
	New Castle	Rich. Jones & Co.	Pott & Bannan	70	Jugular	25	White	Above	300 yards			1			10	10	N. & S.	21,795	60	5	2	16	22,000	
	Spring Vale	Montelius & Milnes	Pott & Bannan	71	Mammoth	30	White	Above	115 yards	28		1			15	15	N. & S.	675	15			6	3,000	Saddle of Vein.
	Centerville	Rogers, Sinnickson & Co	North American Coal Co	72	Lewis	5½	Red	Below	2 miles		300	2	90		30	120	South	17,299	100	2	6	50	10,000	
	Delaware East, No. 1	Jonathan Wasley, Jr.	Delaware Coal Co	73	Peacock	5	Red	Above	300 yards			1			15	15	South		12	1			2,000	Now Colliery.
	East Norwegian	Titus, Alton & Co.	Titus, Lessig & Cake	74	Diamond	6	Red	Above	400 yards			1			20	20	South	2,044	20	2	1	7	12,000	
	Flowery Field	Rich. Jones & Co.	Bonsell & Cumming	75	Grey Ask	6	Red	Below	½ mile		230	3	110		30	140	N. & S. / South	19,062	70	2	11	70	28,000	Slope is on the back of Saddle.
				76	Big	30	White	Below	¾ mile		150													
	Orchard	George Mason & Co.	Titus, Lessig & Adam	77	Orchard	5	Red	Above	⅛ mile			1			20	20	N. & S.	15,099	35	4	10		4,000	Flat on Saddle.
	Gate Vein	J. M. Thomas & Co.	Ronaldson & others	78	Gate	3	Red	Below	1 mile		90	2	60		20	80	South	18,771	75	4			30,000	
	Junction	R. Jones & Co.	North American Coal Co	79	Selkirk	4	Red	Below	500 yards		100	3	60	30	20	110	South	4,457	160	2	1		66,000	Part of this is a new Operation.
				80	Tunnel	5	Red	Below			130													
				81	Black Mine	4	Red	Above			100													
				82	Lawton	5½	Red	Below																

* There is one 20-horse engine used at these Collieries for other purposes not specified in the Table, which makes up the total of four engines and 160-horse power.

† See Kaska William Collieries.

General Division.	Colliery's Name.	Operator's Name.	Situate on the Lands Belonging to	No. of Specimen.	Name of Vein.	Thickness of Vein.	Color of Ashes.	Working Above or Below Water-Level.	Total Length of Gangway Driven.	Length of Tunnel Driven.	Depth of Slope or Shaft.	Steam Engines.	STEAM POWER USED FOR				Dip of Vein.	No. of Tons of Coal Shipped in 1852.	No. Hands Employed.	No. Horses.	No. Mules.	No. Houses for Miners.	Amount of Capital Invested.	Sundry Remarks.
													Hoisting Coal.	Pumping Water.	Breaking Coal.	Total Power.							
						Feet.				Yds.	Yards.		horse	horse	horse	horse.						Dollars.	
WEST NORWEGIAN.	Black Mine...	Geo. H. Potts.	Carey, Lea & Co.....	83	Black Mine.	5	Red	Below	3 miles..	285	343	4	150	40	80	220	S.& N.	36,283	200	2	5	40	68,000	
	Lewis	George Miller.	R. & L. Lewis.....	84	Lewis	6½	Red	Below	900 yards	300	346	3	110		20	130	South	10,108	100	2		18	46,000	En.foot of Shaft
	West Peach Mountain ..	Rogers, Sinnickson & Co	Delaware Coal Co.....	85	P. Mountain	8	Red	Below																N.Sl'pe sinking. N.Breaker building.
				86	Diamond ...	7	Red	Above			40	180	6	180	80	40	300	South	11,629	70	4	4	85	50,000	
				87	Little Vein.	2½	Red	Above																	
	Oak Hill.....	Schultz & Bell	Wetherill	88	Orchard	5	Red	Above	¼ mile...	93		1			6	6	North	6,737	30	4	1	5	4,000	
				89	Primrose ...	12	Red	Above																	
	Oak Hill.....	Edward Pugh.	Miller & Patterson	90	Primrose ...	9	Red	Above	500 yards								South	5,089	20	4	1	8	3,000	
	Oak Hill.....	D. P. Brown & Co.	Wetherill	91	Primrose ...	9	Red	Below	2 miles..		50	2	30		15	45	South	22,177	100	14	1	20	45,000	
				92	Orchard	5	Red	Above																	
	Mt. Laffee....	Charles Miller & Co.....	Miller & Patterson	93	Mammoth ..	40	White	Below	1 mile...		200	2	120		40	160	South	30,734	200		5	60	60,000	New Slope sinking.
	Glenn Carbon	John Stanton.	Dundas & Richards	94	Black Valley	10	White	Above	1 mile...	92		1			20	20	South	34,739	130	6	7	70	54,000	
				95	Mammoth ..	16	White	Above																	
	Glenn Carbon	O. F. Moore..	Dundas & Richards	96	First	7	White	Above																	
				97	Middle	3½	White	Above	2 miles..	164	33	2	40		15	55	North	34,165	81	5	3	60	20,000	
				98	Back	8	White	Above																	
	Thomastson ..	Rich. Heckscher & Co...	Forest Improvement Co...	99	North	9	White	Above																	
				100	South	10	White	Above	800 yards	165		1			20	20	North	21,718	98	4	2	31	40,000	
				101	Jugular.....	80	White	Above																	
	Heckscherville	Wm. Payne..	Forest Improvement Co...	102	Daniel	20	White	Below	4 miles..	450	77	3	40	60	80	130	South	85,994	300	14	21	120	80,000	
				103	Crosby	15	White	Below																	
	Mine Hill.....	D. E. Nice....	Brock & Culp	104	Daniel	14	White	Above	600 yards	50							North	13,036	40	3	2	1	4,000	
	Coal Castle...	John McGinnis & Co....	Miller & Patterson	105	Jugular	60	White	Above	350 yards			1				15	South	17,003	100	8		4	12,000	
				106	Daniel	20	White	Above																	
	Mine Hill Gap	L. C. Dougherty	Miller & Patterson	107	Mammoth ..	13	White	Above	300 yards	10		1			20	20	North	18,192	60	2	4	10	20,000	
				108	Lelar.....	8	White	Above																	
	Pine Knot....	Adams & Miller	Miller & Patterson	109	Mammoth ..	20	White	Below	1½ miles.		120	3	40	60	20	120	South	36,063	100	7	3	50	50,000	
	Mine Hill Gap	John Doherty	James Dundas.....	110	Big Mine Hill	13	White	Below	1 mile...		150	2	15		10	25	South	15,590	60	7		40	30,000	
	Dundas	Wallace, Rothermel & Co	James Dundas.....	111	Black Valley	9	White	Below	260 yards		100	2	60		10	70	South	2,627	65	2	2	14	15,000	New Colliery.
	West Wood ..	Rich. Jones & Co.	Wood & Co.....	112	Black Mine.	7½	Red	Below	650 yards	70	243½	3	40	60	20	120	South	20,826		5	1	74	25,000	
	Rough & Ready	John A. Steinberger, agent	Silliman & Wood.....	113	Twin Veins.	5	Red	Above	1400 yds.	38		1			15	15	South	11,836	63	2	4	18	12,000	
	Patten's Valley	Wm. & Charles Britton.....	Charles Miller & Co	114	Flat	4	Red	Above																	
				115	Li. Diamond	4½	Red	Above	½ mile...			2	40		15	55	South	24,849	70	10	6	14	20,000	
	Great Western	Gideon, Bast & Co.	Wadsworth, Kimber & Co.	116	Reese Davis	10	White	Below			190														
				117	Diamond ...	6½	Red	Below	1 mile...	40	240	4	40	60	85	135	South	91,460	390	29	7	60	90,000	
	Umberhower .	Henry Eckel..	Swatara Coal Co.....	118	Umberhow'r	8	Red	Above	400 yards								P'rp'n	11,107	25	1			2,000	
	Black Valley..	Henry Eckel..	Donaldson & Co	119	Mammoth ..	20	White	Above									South		50	4	26	8	7,000	
				120	Ten Foot...	10	White	Above	2 miles..																
	Cressonville ..	F. Garretson & Co.	John C. Cresson & Co.....	121	Tunnel	5	Red	Below			200														
				122	Black Mine.	6	Red	Below	1 mile...	116	220	5	90	110	10	210	South	12,360	90	4	2	80	50,000	
	Broad Mountain	R.H. F. Horton	Donaldson & Co	123	Mammoth ..	30	White	Above																	
				124	Black Heath	13	Red	Above	600 yards	330		1			20	20	South	2,644	140	8	4	46	23,000	
				125	Primrose ...	9	Red	Above																	
	Salem	M. G. & P. Heilner.....	Miller & Hoffman.....	126	Salem	4½	Red	Below			100														
				127	Tunnel	4	Red	Below	1½ miles.		100	3	110		15	125	South	18,577	200	1	9	20	40,000	
	Black Valley..	M. G. & P. Heilner.....	Brock, Culp & others.....	128	Black Heath	5	White	Below																	
				129	Buck.....	7	White	Below	1½ miles.		150	2	60		15	75	South	37,378	150		8	90	55,000	
	Kantner	M. G. & P. Heilner.....	Joseph Jeanes & others ...	130	Kantner ...	7	Red	Above	1½ miles.			1			20	20	South	16,593	150		9		20,000	
	Wm. Penn....	H. C. Harper..	Brock, Culp & others.....	131	Kear	9	Red	Below	150 yards		100	2	35		10	45	South	17,579	40	4		4	16,000	
	Orchard.....	Richard Kear.	Wadsworth, Kimber & Co.	132	Orchard	6	Red	Below	1½ miles.		200	2	40		20	60	South	37,813	200	1	5		55,000	
	Peach Mountain.....	McCormick & Clark.....	Donaldson & Co	133	P. Mountain	7	Red	Above				1			7	7	South	10,273	50	1	5		15,000	
				134	Five Foot..	5	Red	Above	1½ miles.																
	Branch Dale..	F. McDonald.	Wm. Dewart & M. Weaver	135	South Spohn	7	Red	Below																	
				136	North Spohn	6	Red	Above	1 mile...	70	140	2	30		20	50	South	16,487	100	9	1	50	30,000	
				137	Big Diamond	8	Red	Below			70						North							
	Phœnix	Charles Miller & Co.....	R. F. Stockton & Co	138	Phœnix	6	Red	Below	3 miles..	90	100	5	140		40	180	South	52,224	300	12		65	110,000	
				139	Little Tunnel	5	Red	Above									South							
	Kantner	F. McDonald.	Joseph Jeanes & Co.....	140	Kantner ...	10	Red	Above									South							
				141	P. Mountain	8	Red	Above	1½ miles.	20		1			15	15	North	15,056	70	10	3		10,000	
	Fairview	L. S. Spangler.	Donaldson & Co	142	Ten Foot...	10	Red	Above	¾ mile...			1			20	20	South	16,216	60	2	9	2	7,000	
	Diamond	Geo. Spencer.	George Spencer & J. Jeanes	143	Diamond ...	10	Red	Below	500 yards		120	2	40		20	60	South	15,677	150	6	8	20	10,000	
	Black Heath..	Sutton & Wright.....	Jacob Serril	144	Black Valley	7½	White	Above				1			15	15	South	21,085	110			30	10,000	
				145	Back	7½	White	Above	1¼ miles.																
	Spohn Tunnel	L. S. Spangler & Co.....	Donaldson & Co	146	Spohn	4	Red	Above	½ mile...	200		1			20	20	S.& N.	*	50		2		12,000	
	Branch Dale..	Martin Weaver	Dewart & Weaver	147	P. Mountain	14	Red	Above				1			10	10	South	5,881	50	8	2	12	35,000	
				148	Kantner....	2½	Red	Above	¾ mile...																
	Franklin	F. McDonald..	Wharton & others	149	Primrose ...	14	Red	Below	New		110	2	40		12	52	South		40	4		20	30,000	
	Patten Valley.	Dolbin & Rogers	Wadsworth & others	150	Reese Davis		White	Above				1			20	20	South	23,300	50	4		10	20,000	
				151	Forestville .		White	Above																	
	Lorberry	Kitzmiller, Stees & Co..	Swatara Land Co	152	Big	30	White	Above	1 mile...								S.& N.		40	2	1	20	7,000	
	Spohn Tunnel	L. S. Spangler & Co.....	Donaldson Land Co	153	Spohn	4	Red	Above	½ mile...	200		1			20	20	S.& N.		50		2		12,000	
	Otto	R. Heckscher & Co.....	Forest Improvement Co...	154	T. Williams	10	Red	Above				4	25				S.& N.							
				155	White Ash.	12	White	Above	2¾ miles.		35	1	100	100	15	175	S.& N.	71,659	300	8	16	80	60,000	Shaft sunk 45 yards.
	Muddy Branch	Edwards & Morgan	Forest Improvement Co ..	156	Forestville..	10	White	Above	200 yards	170							South		10	2	2	10	2,000	
	Swatara	Brown & White	Forest Improvement Co ..	157	Big	10	White	Above				1			12	12	N.& S.	21,737	130	3	9	41	20,000	
				158	Little	5	White	Above	¾ mile...								N.& S.							
	Tuckerville...	J. R. McCreary	Forest Improvement Co ..	159	Big	10	White	Above	1 mile...			1			15	15	South	20,339	125		5	42	20,000	
	Forestville....	David Glover.	Forest Improvement Co ..	160	Forestville..	6	White	Above	1¾ miles.	70	33	2	60		15	75	South	47,090	66	2	15	59	20,000	
	Black Heath..	Rich. Heckscher & Co...	Forest Improvement Co ..	161	Black Heath	7	White	Above	1½ miles.																
				162	Black Vein.	6	White	Above	½ mile...	125							South	33,835	50	2	10	40	10,000	New Colliery putting up Breaker.
S.C.	Salem Hill....	Waddington & Ogden.....	Thomas Vermilye, Trustee	163	Salem	5	Red	Below	150 yards		333½	7	80	180	30	190	South	2,000	60	2	2		70,000	
S.V.	Bear Ridge...	Silliman & Reed	Silliman & Wistar	164	Barclengh ..	7	Red	Above																	
				165	Three Foot.	3½	Red	Above	1¾ miles.	513		1			15	15	South	10,500	50	5	4	18	12,000	
TAMAQUA OR LITTLE SCHUYLKILL.	E. & F. West.	J. & R. Carter	Lit. Sch. Nav., R. R. & C. Co		E. & F. West		White	Ah.&Bel.	3½ miles.	880	100	8	50	50	20	120	South	37,539	150	8	12	10	60,000	
	Greenwood ..	J. & R. Carter	Greenwood Co		E. & F.		White	Ah.&Bel.	1 mile...	1320	100	8	50	50	20	120	South	37,535	100	4	20	10	60,000	
	D. E. & E. West.....	Heaton & Carter	Lit. Sch. Nav., R. R. & C. Co		D. E. & E. W.	12&24	White	Ab.&Bel.	3 miles..	42	128	8	30	30	40	100	South	47,500	160	4	18		50,000	
	Newkirk	Bowman & Richardson .	Lit. Sch. Nav., R. R. & C. Co	168	J. & K.	16	Red	Below	1½ miles.	145	110	8	30	30	10	70	South	28,000	100	3	7		50,000	
	Providence...	Geo. Wiggan & Son.....	Lit. Sch. Nav., R. R. & C. Co	169	C.....	18	Red	Above	1 mile...	120		1			12	12	South	28,500	100	9	2	15	50,000	
	Buckville.....	Jones & Cole.	Lit. Sch. Nav., R. R. & C. Co	170	E.E.E.U&CC	12&20	White	Above	1 mile...	300	75	3	40	40	20	100	South	28,627	100	2	5	11	60,000	
	Newkirk	Jones & Cole.	Lit. Sch. Nav., R. R. & C. Co		E. W. & C. C	3&18	White	Above	2 miles..	300		1			10	10	South	29,100	80	2	4	2	25,000	
	D. West.....	R. Ratcliff & Co	Lit. Sch. Nav., R. R. & C. Co		B. & C.		White	Above	½ mile...			1			10	10	South	22,233	60	2	6	9	10,000	
	Newkirk	R. Ratcliff & Co	Lit. Sch. Nav., R. R. & C. Co		F.....	10	Red	Below	½ mile...	50	200	2	60		20	80	South	20,103	70	3	6		60,000	
	P. West.....	W. Donaldson	Lit. Sch. Nav., R. R. & C. Co		Q. Vein	40	White	Above	¾ mile...	70		2	80		10	40	North	16,185	100	5	10		65,000	[sinking.
	Shaft No. 1...	W. Donaldson	Lit. Sch. Nav., R. R. & C. Co		P. Vein	25	White	Below			100	1	30	30		60	90 deg.		18				15,000	This shaft just
	Levan	Wm. Levan..	William Levan		F. Vein	10	White	Below	¼ mile...	40	100	2	40		15	55	South	8,000	70	1	4		35,000	New Colliery.

* Shipments included in works above, No. 142.

This collection consists of 168 specimens of coal from that part of the First Anthracite Coal Field, whose outlets are at Mount Carbon, Port Carbon, Schuylkill Haven, and Port Clinton, and shipped by the Reading Railroad and the Schuylkill Canal. It comprises within its limits 111 collieries, of which 58 are Red Ash Coal and 53 White Ash Coal. 7 of the Red and 4 of the White Ash Collieries were not in operation during the year 1852, being new ones. 62 of these collieries are working coal out above water-level, and 49 below water-level. 48 of the Red Ash Collieries shipped, during the year 1852, 776,675 tons, and 40 White Ash Collieries shipped 1,520,744 tons, making a total of 2,297,419 tons. This is not the whole amount of coal shipped during the year 1852, as there were collieries in operation during that year that are not new in operation; consequently this collection does not include them. There was shipped from this region, including the Little Schuylkill district, *via* Reading Railroad, 1,650,912 tons, and *via* Schuylkill Canal, 800,088 tons, making a total of 2,450,950 tons. The Little Schuylkill region sent of this amount 325,099 tons. There are 122¼ miles of under-ground railroad, 6¼ miles of which are through rock tunnels, and 116½ miles in gangways through coal. There are 210 steam-engines employed directly at the various collieries; 3,805 horse-power for hoisting coal and pumping water from slopes and shafts, the deepest of which is 353 yards, and the shortest 33 yards; 1,375 horse-power for pumping water only, and 1,891 horse-power for preparing the coal for market, making an aggregate of 7,071 horse-power. There are employed, inside and outside, at the various mines, 9,792 hands, 468 horses, and 569 mules. There are 2,756 miner's houses, exclusive of houses occupied by miners and laborers in the larger towns. The amount of individual capital invested in the coal business is $3,462,000. This amount does not include that invested by the land-owners, which is also very large. The thickest vein worked is 30 feet, and the smallest 2 feet.

6. *The Hopewell Cold Blast Charcoal Furnace, Berks County,* Brooke, Buckley & Co., employs but one ore material, that of the Hopewell ore bank in Chester county, which is fluxed with limestone of the Conestoga valley, producing an excellent iron. The ore is a magnetic oxyd, in some places beautifully crystallized in large octahedra, with highly brilliant planes. It occurs in the red sandstone, or middle secondary formation, and is an injected vein or lode, of great thickness.

The Warwick Mine, near St. Mary's, Chester county, was also examined. This mine occurs also in the red sandstone formation, in the vicinity of trap dikes, and appears to have been injected into the sandstone in a melted condition (Rogers). The ore is a magnetic oxyd, possessing polarity in some specimens. It is worked partly open, and partly by shaft; specimens of both kinds have been obtained for the collection. The following analysis is given in Rogers' Fourth Report, p. 213:—

Color, black; luster, metallic, but rather dull; contains numerous cavities, the walls of which are covered with ferruginous and talcose matter, and with perfect crystals of octahedral iron in rhombic dodecahedra; the ore possesses magnetic polarity.

Magnetic oxyd of iron.....	97·61 = metal, 70·19 per cent.
Alumina	trace.
Titanic acid	none.
Silica and insoluble.....	1·69
	99·30

Jones' Mine, near Morgantown, Berks county, possesses the same geological position as those last mentioned. This mine was first opened for copper, and subsequently abandoned. Those specimens of iron ore, for which it was subsequently worked, which contained too much copper to be used in the furnace, were cast aside, and the best iron ore selected. At present, mining operations are very extensive at this locality, both for iron and for copper. A large mill has been erected by a New York Company, where the ore, after having been roasted, is passed, in a pulverulent state, over the surfaces of a number of cylinders composed of magnetic bars. The iron and copper are thus, to a certain extent, separated at the same time.

Jones' ore consists of octahedral or dodecahedral magnetic oxyd. Some specimens occur with crystallized carbonate of lime; others with dodecahedral iron pyrites, and with copper pyrites. Malachite, silicate of copper, serpentine and crystallized carbonate of magnesia, also occur at this locality.

The Elizabeth Mine, Chester county, near Knauertown, is of the same position as the former. Fine octahedral crystals of magnetic oxyd are found at this locality; they occur pure, with carbonate of lime, octahedral iron pyrites, and actinolite. The rhombic spar of this locality is filled with octahedral iron pyrites. Specimens of molybdenite, on quartz and actinolite, are sent from this locality.

7. *Joanna Furnace, Berks County,* Darling & Smith, a cold-blast charcoal furnace, using the Jones' and Warwick ores just mentioned. Specimens of these ores are in the Exhibition, among which are Jones' ore, with and without lime, the dodecahedral variety of the same, and the Warwick magnetic oxyd. These are fluxed with the limestone of Formation II. Crystalline slag, from gray and white pig metal, was also sent from this locality. The iron made here is of a superior quality.

From Reading, the following collections were obtained:—

8. *Henry Clay Anthracite Furnace,* Eckert & Brother, *Reading.*

The ores used at this furnace are magnetic oxyds and hematites, from various localities of Berks County, and are fluxed with the limestone from Reading and the anthracite of the Pottsville basin. In the collection of ores are several specimens of a magnetic ore from Roscombmanor township, which was tried in the furnace and rejected as not yielding a good metal. This ore is full of crystals of zircon, which present a fused appearance on the edges. A description and analysis of this zircon* is as follows:—

"It occurs in large brittle crystals, firmly imbedded in magnetic oxyd of iron. The crystals are right prisms, terminated by right pyramids, the angles of which were frequently modified. The planes, edges, and angles, frequently uneven and rounded as if by incipient fusion. Color, chocolate brown; opaque; luster, adamantine; hardness, between quartz and topaz; density, 4·595; infusible; deepens in color when heated."

By analysis, it yielded—

Silica.....	34·07
Zirconia.....	63·50
Peroxyd iron.....	2·02
Water.....	·50
	100·09

Dr. Genth has also discovered in this ore large quantities of alanite, which yields, by his analysis, 26 per cent. of oxyd of cerium.

The Monocacy Mine is situated on the edge of the red sandstone formation, between Monocacy Hill, which is primitive, and the Oley limestone formation II.

The Oley Mine is situated at the junction of the primitive with the No. 1 sandstone.

The Penn Mountain Mine is opened at the base of the hill east of Reading, at the junction of formations I. and II. Its ore is found in beds, covered with gravel, and is reached by shafts. The rock beneath it is chlorite slate, and contains veins of magnetic oxyd. The Cushing Hill ore has already been described in treating of the Mt. Laurel Furnace. From the Henry Clay Furnace, the Exhibition possesses specimens of this ore with lime, and in serpentine. The hematites are from Bern and Spring townships, that from Bern being called the Jefferson ore (situated in the second limestone formation).*

Messrs. Eckert & Brother are building an additional first-class anthracite stack adjoining their old furnace. Another first-class anthracite furnace, in process of construction, is built near the Henry Clay, by Messrs. Seyfert, McManus & Co., who intend to rely upon the Cornwall ore of Lebanon county.

The Leesport Iron Company, also, are erecting first-class anthracite furnaces at Leesport. The first stack was expected to have been finished by the 1st of July, and the second some time in the summer of 1854. The Moselem ore is to be used principally at these furnaces.

Quite an extensive export is made from Berks county of rifle barrels, averaging from sixteen to twenty thousand yearly. They are distributed over the whole country, but find a market principally in the West. They are made at forges, which are worked by water-power, in various parts of the county of Berks. Col. J. H. Keim has contributed specimens of this manufacture in its several stages, which represent, No. 1, the merchant bar from which the barrel is made; No. 2, the same preparatory to welding; No. 3, barrel welded and bored; No. 4, barrel straightened and finished, as exported. The barrels are rifled, polished, and otherwise finished, by the gunsmiths who purchase them.

George M. Keim, Esq., has sent a collection, consisting of various ores and minerals, from the neighborhood of Reading. Of these, the molybdenite has been examined by Dr. C. M. Wetherill.† It occurs, of considerable purity, in plates and scales, in a quartz matrix; color of plumbago, but more brilliant; streak on paper like plumbago, on porcelain olive green; impressible to the nail; density, 4·52; composition,—

Water.....	0·297
Sulphur.....	38·198
Silica.....	2·283
Oxyd of iron.....	3·495
Molybdenum	53·727
	100·000

P. W. Sheafer, Esq., Mining Engineer (of Pottsville), has contributed a series of the red shale, under the coal of Schuylkill county, containing fossils, some of which are said to be new; a series of coal slates, and the iron ores of the coal formation, together with coal from Scranton and from Carbon county.

The Coal Formation (XIII.) of Pennsylvania consists of "dark blue shales, bluish-gray argillaceous sandstones, coarse quartzose, conglomerates, and seams of anthracite coal," and rests upon the coarse conglomerate of Formation XII. (Rogers). The dark blue shales contain "highly ferruginous bands, in some of which occur layers of tolerably rich iron ore." Specimens of these will be found in Mr. Sheafer's collection just mentioned; that of the Pinkerton vein, St. Clair tract, has been analyzed. (Rogers' Fifth Report, p. 125.)

Description.—Structure, nodular, concentric, rather compact; color, internally, slate blue—externally, dirty brown. Average of the whole, taken for analysis:—

Carbonate of iron.....	42·38	metal iron, 34·86 per cent.
" manganese....	3·64	
Peroxyd of iron.....	21·32	
Alumina.....	trace.	
Silica and insoluble.....	27·63	
Water.....	5·03	
	100·00	

Ore from same locality:—

Structure somewhat nodular; compact; color, slate blue.

Carbonate of iron.....	66·67	= metal 33·96 per cent.
Peroxyd of iron.....	2·55	
Carbonate manganese	traces.	
Carbonate magnesia		
Carbonate lime.....	8·25	
Alumina.....	2·25	
Silica and insoluble...	13·90	
Water.....	6·10	
Loss	0·28	
	100·00	

The ores of the coal formation are partially worked, but not unmixed with other ores, on account of their not having been as yet sufficiently developed. The following ore from the Lee Lands tract was examined by Dr. C. M. Wetherill. It was of dark gray color, of conchoidal fracture, and occurred in a bed said to be eight feet thick. It contained carbonic acid, water, carbon, iron, lime, and traces of manganese and magnesia. By the moist way, it yielded 49·21 per cent. of iron (the alumina was not separated); and by the dry way, 36·25 per cent. of metallic iron.

From Pottsville, the Exhibition possesses a unique and very valuable collection of 168 specimens of coal from Schuylkill county, made by Col. J. M. Wetherill and Mr. C. W. Peale. This interesting collection exhibits the mineral so important to Pennsylvania in the most satisfactory manner. Important statistical information with respect to this region is embodied in the valuable table appended hereto, and which has been compiled by the above-named gentlemen.—(See Coal Table, previous pages.)

* See Dr. C. M. Wetherill, in Transactions American Phil. Society.

* A geological map of Berks County, by Dr. J. P. Hiester, of Reading, will be found in the Proceedings of the Pennsylvania State Medical Convention. The difficulty of reproducing a geological map in a printed page, without the aid of colors, has rendered it inexpedient to republish Dr. Hiester's map in this place, agreeably to Dr. Wetherill's intention.—Editor.

† Transactions of American Philosophical Society.

The Ores of Montour and Columbia Counties.—Red fossiliferous and argillaceous iron ore (argillo-calcareous, lenticular, and oligiste iron ore, of various authors).

The ore used by the furnaces of this region is a fossiliferous red oxyd, which, from its nature, great extent, and the valuable iron it yields, is perhaps the most interesting in the State. It occurs in the formation V. of Rogers. The IV. formation, which forms the Kittatinny range, and upon which this formation rests, consists of "hard white and gray sandstones, and coarse marine quartzose conglomerates;" the uppermost layers of this IV. formation contain the white and gray sandstones. The overlying V. formation consists of red and variegated sandstones and shales, containing, like the last formation, impressions of fucoides. Rogers subdivides this formation into three groups. The lowest, a dense and heavy dark-brown cuboidal sandstone; above this are strata of shales of different colors, the olive ones of which, especially, contain impressions of shells. In this division occur thin layers of highly fossiliferous limestone. In this part of the formation is found also the *fossiliferous ore;* the top of the formation is a thick mass of crumbling reddish brown shale, which becomes more and more calcareous as it approaches the next formation. The formation VI., which overlies the preceding, is the fossiliferous limestone. It is from the top stratum of shale of formation V. that Rogers supposes the iron ore has been derived, the menstruum holding it in solution penetrating to the lower bed, and taking the place of the calcareous matter of the shells, which it expels in some cases almost entirely. Below the fossiliferous ore-bed is another, somewhat fossiliferous, containing but little lime and much silica; it has the appearance somewhat of red sandstone, and splits in cuboidal blocks. Montour's Ridge, where the ore is mined, ranges nearly east and west, from the west to the north branch of the Susquehanna, a little below Danville. At the north branch it bends to the northward, and dies out some four or five miles north-east of Bloomsburg. It presents an anticlinal axis, the strata having been upheaved at an angle of 15° to 25°, dipping to the north and south, on either side of the Ridge. The ore is reached at its outcrop, on the flanks of the hill and in ravines, by drifts and levels. At its outcrop the ore is always more cellular, or porous, and softer, having been the more readily exposed to the dissolving action of rain-water, which has removed portions of its lime. The deeper part of the stratum is more compact. Specimens illustrating this formation are in the collection. The mining operations have well developed the fossiliferous ore of Montour's Ridge, several distinct layers having been explored and worked since the publication of Rogers' Report on this region.

The red fossiliferous ore is here associated with the upper silurian rocks. This ore has a very wide distribution in the United States. It occurs in beds of greater or less thickness, interstratified with limestones, shales, &c., and is usually highly calcareous, with an oolitic or concretionary structure, and frequently fossiliferous. It appears in Oneida, Madison, Cayuga, and Wayne counties, in the State of New York, and it likewise extends through Maryland and Virginia. It is also largely developed in Alabama, and probably occurs along the intermediate distance. From its proximity to the anthracite coal in Pennsylvania, it becomes in that State an ore of the greatest importance.

The same ore exists in the upper part of the Devonian rocks, and in another position near the base of the coal measures. The latter is an important ore in Pennsylvania, and is represented in the Exhibition by numerous specimens.

9. At Bloomsburg, Columbia county, the anthracite furnace *Irondale*, of the *Bloomsburg Iron Company*, is in operation. From here are several specimens of the fossiliferous ores of Montour's Ridge, which are used at this furnace, namely, the ore of Hemlock Creek, in its three varieties of soft, intermediate, and hard. As has been already stated, the soft ore occurs high in the bed at its outcrop, where it has been altered by the weather, and which becomes harder the deeper it is found. The following analyses are from Rogers' Second Report of the porous variety from the outcrop of the north dipping bed, west side of Hemlock Creek. An average specimen yielded:—

Peroxyd iron	85·40	= iron about 60 per cent.
Silica	7·10	
Alumina	5·00	
Water	2·10	
Lime and carbonic acid	trace.	
	99·60	

Another specimen, from a depth of twenty yards below its outcrop, gave—

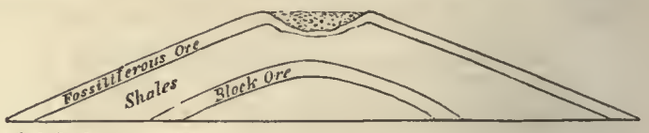
Peroxyd iron	61·30	= iron about 43 per cent.
Silica	2·80	
Alumina	trace.	
Lime	17·84	
Carbonic acid	15·33	
Water	2·20	
	99·47	

A small amount of protoxyd is combined with the peroxyd of iron. The hemlock ore is deemed the best at this furnace. There are also specimens of *block ore* of a seam 400 feet below the Danville block ore from Bittenlender's farm, together with the hard ore from the other side of Fishing creek, at the Fanandsville farm (of which there is also a specimen with the wall-rock). At the time of Rogers' Second Report, this ore was transported 100 miles on the canal to the Fanandsville Furnace, Clinton county. Ore of the same kind is used at Irondale, from Opperman's and Stroup's farms. The limestone used for flux is of the Ridge, from Schaefer's quarry, and the fuel the Mount Pleasant coal of Wilkesbarre (Lance's mine). The yield of iron of this Company since the publication of the statistics of the iron manufacture (see table prefixed to the report) is as follows, the year commencing the first of May, 1851–'52, 7652 tons; and from 1852–'53, 8601 tons. About two tons of the ore yielded one ton of pig metal. The iron made at the furnace is classified as follows:—

1. A No. 1 Foundry.
2. No. 1 Foundry.
3. No. 2 Foundry.
4. Bare No. 2 (between Forge and Foundry).
5. Gray Forge.
6. White Forge.

Several slags corresponding to the various kinds of iron are in the collection. The pumice slag, which occurs in several of the contributions, always indicates a No. 1 iron. It owes its spongy nature to water thrown upon it, and consists thus of innumerable glass cells, containing, beside other gases, sulphuretted hydrogen. These cells are continually bursting (the action lasting for years), and to this cause is due the smell of sulphuretted hydrogen which this kind of slag always possesses. A remarkable specimen of iron is T 18, which was found in the slag. It is a mass of metallic iron, formed of interlaced lance-shaped and branching crystals, resembling exactly the leaves, or fronds, of the fern. The surfaces appear rounded under the microscope. The iron is hard, brittle (especially across the crystal), and when freshly broken, of a brilliant white and crystalline appearance. The axes from which its smaller crystals branch, though preserving a *general* parallelism, are yet inclined to each other at all angles. Owing to the interlacing of the fronds (like two fern leaves intertwined with the same stem, and two systems of leaves the planes of which are at right angles to each other), the mass presents a quadrated appearance, giving a first impression of resemblance to some crystallizations of metallic bismuth.

The following section of the Ridge at Hemlock Creek, the property of Paxton & McKelvey, was drawn from information given by Mr. D. P. Davis, head-miner of Danville, and shows the position of the ore-beds at that place.



Hemlock Creek.

Section of Montour's Ridge at Hemlock Creek, on the property of Paxton & McKelvey.

The fossiliferous ore of both sides of the Ridge here meets at the summit, at which junction there is a large depression filled with water and clay.

Rogers has given (Second Report) the following measurements of a section from the anticlinal axis on Hemlock Creek, southward to the Catawissa Mountain:—

Vertical thickness in feet.		
304·01	from	anticlinal axis to iron ore.
257·68	"	iron ore to red shale.
1,372·66	"	commencement of red shale to limestone No. VI.
1,934·35	"	anticlinal axis to limestone.
981·56	thickness of limestone No. VI.	
4,471·59	"	of slate, shales, and sandstones No. VIII.
258·48	"	of alternating beds between Nos. VIII. and IX.
4,172·35	"	of shales and sandstones of No. IX.

Section of Montour's Ridge at Danville and Montour.

The accompanying sketch, from Mr. Davis, shows the formation of the Montour Ridge ore beds at Danville. The Ridge at this place runs east and west, and the section is north and south through Danville and the Forks, or Montour. In the figure, *a b c d* represent the shales and slates containing the ore; the thickness of the strata at *c* is 300 feet; and *d* represents the stratum of slate, with layers of limestone and red shale. The ore seam No. 3, which is from six to nine inches thick, is the silicious or New Danville block ore, composed of sand and peroxyd of iron. No. 5 is the Danville block ore (also silicious), and No. 6 the fossiliferous ore, or limestone ore, containing numerous impressions of shells. The outcrop is disintegrated, and the ore becomes more and more solid as it is more deeply covered.

10. *The Montour Iron Company* of Danville, Montour & Co., have at present two large anthracite furnaces in operation, running together about 330 tons a week, all of which is forge metal. The quantity made the last year, ending 1st Nov., 1852, was 15,210 tons. Two additional furnace stacks are in progress of construction, and are expected to be completed by autumn of 1853. The Columbia Furnace, of Danville, makes gray foundry iron only, at the rate of about 60 tons a week.

The ore used by the Montour Iron Company is from their mines on the Ridge immediately behind the works, to which it is brought from the openings by a railroad. The principal ore strata of the formation are, as has been already stated, those marked

3, 5, and 6, in the last diagram; but the Company propose working three additional ores, marked 1, 2, and 4. Specimens of these six ores are in the Montour contribution, and are marked in the Catalogue, from 1 to 6 respectively. Nos. 1 and 2 have not yet been worked to any extent, and do not appear to be very rich in metal; but No. 4, called the middle vein, between the old and new Danville block ore, is said to yield well. The Exhibition contains both the soft and hard varieties of the fossiliferous ore No. 6—the ore with wall rock, and the top slate of the fossiliferous ore of Valleytown, two miles to the north of Danville.

The following analyses of these ores, and of the Danville cast iron, are from Rogers' Fifth Report:—

Calcareous variety.—Structure somewhat slaty; micaceous, fossiliferous; luster, glimmering; color, dark bluish brown.

Peroxyd iron	30·34 = iron 21·03 per cent.
Oxyd manganese	trace.
Carbonate lime	62·43
" magnesia	2·79
Silica and insoluble	2·64
Water	1·80
	100·00

Silicious variety.—Structure massive, occurring in plates of variable thickness, resembling slabby red sandstone; color, brick red; somewhat fossiliferous; not micaceous, and free from luster.

Peroxyd iron	70·63 = iron, 48·97 per cent.
Alumina	0·57
Carbonate lime	2·46
Silica and insoluble	23·77
Water	2·57
	100·00

Cast iron, from Danville.—Texture soft; brilliantly crystalline; gray.

Iron	94·94
Silicon	2·03
Manganesium	0·05
Aluminum	trace.
Carbon	2·98
	100·00

There are also two varieties of the limestone flux from the north of the Ridge, and two from the south. At the Montour Works, the latter is esteemed the best. The coal is from Wilkesbarre. There are also contributed from these works specimens of slag, forge pig, puddled bar, and rail. The latter was cut off from a rail made at the time of visiting the works, and is an average specimen of the work done at the mill.

Anthracite is used in the puddling furnaces. During the year ending with Nov. 1st, 1852, 11,222 tons of rail were made here. The mill averages now about 1,000 tons a month. Extensive additions are in progress of construction, which will double the present capacity of the works.

11. *The Chulasky* (anthracite) *Furnace* of Mr. SAMUEL R. WOOD, at Red Point, Northumberland county, was also visited. The ores used here are from both the north and south side of Montour's Ridge, and mostly from property owned by Mr. Wood.

12. *Ralston* (after a slumber of some years, is again becoming the scene of active iron operations under the stimulus of the recent prosperity in this powerful industry) is situated in the Lycoming coal basin, which is an ellipse, of which the major axis is about seven miles in length, and in direction from north-east to south-west, and the minor axis four miles. The center of the coal basin is situated near Dutchman's Run. The inclination of the strata is very slight, being 1° 20′. The dip (Rogers) is gently westward at the Rock Run mines; on Dutchman's Run, it is towards the east south-east, and a few miles up the main branch of Rock Run, to the north-west. The accompanying map, by D. S. GREEN, Esq., Civil Engineer, of Ralston, will illustrate these localities, as well as the different coal and ore openings. The hills of this locality are 1,000 feet in height, with level summits, the valleys and ravines with which the basin is scored being the result of erosion. The coal is found near the tops of the mountains, at an elevation of some 860 feet from Lycoming Creek, Ralston itself being about 800 feet above tide-water (State Reports). The coal is brought down from the mountains, by a railroad of steep grade. That on Rock Run, which is now in a dilapidated condition, and disused, is six miles in length, and reaches the coal openings with two zigzags, and distant about two miles from Ralston. The following tabular section, by Mr. Green, will show the structure of this region. As will be seen, the formations rise here from Formation X. of Rogers.

Section of the LYCOMING COAL VEIN, at Ralston. Inclination of its strata, one degree and twenty minutes.

Conglomerate, 60 feet.	
Slate and Fire Clay.	
—Iron Ore, and seven seams of Bituminous Coal,— —each from 20 to 36 inches in thickness.—	
Sandstone, 46 feet. —Formation XII.—	
Quartzose Conglomerate, 60 feet.	
Argillaceous Cast Iron (white ore), 3½ to 4 feet.	1100 feet.
Carboniferous Sandstone, 93 feet.	
Red Iron Ore, 4 feet thick.	
Sandstones and Shales. Formation XI.	
Mountain Limestone (conglomeritie).	
Red Sandstone. Formation X.	
Lycoming Creek.	

13. The old *charcoal furnace* at *Actonville*, of eight-feet boshes, which was established in 1840, has been out of blast for some time. The iron made from the argillaceous carbonates of the district was very highly esteemed for foundry purposes. A small piece of pig metal, which was found at the furnace, is sent as a specimen, together with some of the slag. The flux was limestone of Formation VI., which had to be brought from Williamsport, and of which the following is the analysis (Rogers):—Color, bluish-black; compact fracture; conchoidal; fossiliferous.

Carbonate lime	98·30
Carbonate magnesia	trace.
Alumina and oxyd of iron	none.
Insoluble	1·30
Water	0·40
	100·00

A New York Company, with the name of the "Lycoming Iron Works" (Mr. FREEBORN, Manager), have commenced active operations on Frozen Run, near Actonville. The old furnace is to be repaired, and set in blast this summer as a charcoal furnace. Two new bituminous coal furnaces, of 15-feet boshes, are in progress of erection (see map for their position). These new furnaces, it is expected, will commence operations within a year. The coal and ore mines of the Company are restricted on both sides of the hill above the level of the furnaces, at an altitude of 700 feet. The ore and fuel will be delivered at the trunnel-head, by means of a railroad now constructing, and the works will communicate, by a short branch, with the Williamsport and Elmira Railroad. The coal will be coked or not, according to circumstances and the kind of ore used, which varies with the different seams. It is proposed to try the limestone of the neighborhood, a specimen of which from Lick Run, Lycoming county, accompanies the collection. This limestone contains 17 per cent. of iron. The ore mines are open in two places on the furnace-side of the mountain, and have been proved (though not opened) upon the other side. The ore is an argillaceous carbonate in Formation XI.; it is of light-gray, pinkish, and red colors. At the outcroppings, it is more or less disintegrated, and quite dark, but is solid when deeper in the seam. There are two principal ore-seams: one, the red ore, four feet in thickness; and an upper seam, the white ore, which is from 3½ to 4 feet, and immediately under the conglomerate. Besides these, are slates among the coal seams, containing much nodular iron ore. The following analyses of these ores are from Rogers' Fourth Report:—

Ore from Ralston, upper part of the bed.—Spathose; texture somewhat laminated; silicious; color, ash-gray.

Silica and insoluble	28·80	
Alumina	1·00	
Protoxyd of iron	42·22	= iron, 32·06
Lime	0·50	
Carbonic acid	24·00	
Water	4·28	
Loss	0·50	
	100·00	

Ore from the bed at Actonville.—Light-gray, mottled; consists of minutely crystalline carbonate of iron; of pinkish-yellow color, sometimes velvet-like.

Silica and insoluble	28·7	
Alumina	0·8	
Protoxyd iron	42·2	= iron, 32·8 per cent.
Carbonate lime	0·6	
Carbonic acid	25·8	
Water	1·5	
	99·6	

At the old coal mines on the Red Run the first mining operations of this region were undertaken some twenty-five or thirty years ago, but these mines have not for some time past been in operation. Iron ore has been recently developed at this locality. A Schuylkill County Company (Carter's) intend working these mines for both coal and ore, and will erect three or four furnaces. The coal which has been used experimentally at the old Actonville Furnace is from a 32-inch seam, 106 feet above the white ore, and is of a dry nature. Seven feet above this seam is another of 20 inches, of a more fatty nature, and a much better coal than the preceding. Upon these two seams the Lycoming Iron Company at present rely. The following is Rogers' analysis of the Ralston coal:—From upper part of large bed; columnar; irregularly cubical; fracture irregular; color, shining-black, in parts dull.

Volatile matter	20·50	
Coke	79·50	
	100·00	Ashes in coal, 500 per cent.

Ores of the Kittatinny and Bald Eagle Valleys.—These two valleys contain the valuable ores of Clinton, Center, Huntingdon, and Blair counties, which are used in eight of the furnaces of the collection. It will be appropriate, therefore, in this connection, to describe the geological formation of these valleys, which are included between the Alleghany, the Bald Eagle Ridge, and Tussey's Mountain, or their continuations; mountains which have a north-east and south-west direction. The Kittatinny Valley lies between Tussey's Range and the Bald Eagle Ridge, and contains two parallel anticlinal axes, which have upheaved the Kittatinny and Brush Mountains. It contains the limestone formation No. II. of Rogers. A range of interrupted hills of sand and clay runs through the valley, in which (especially on their south-eastern slopes) are situated the hematite ores for which Center county is celebrated. The ore occurs in pockets, and is of various forms; compact cellular pipe-ore, in Good & Curtin's, the Bald Eagle, and Huntingdon furnaces, have their ore-banks in the hollows, between the hills. The Pennsylvania furnace-mines are situated in the south-eastern anticlinal axis.—(Rogers.)

The Bald Eagle Ridge, which separates the two valleys, is composed of the sandstone rocks of Formation IV. Springfield Furnace possesses several ore banks of hematite in Formation II.

The valley between the Bald Eagle Ridge and the Alleghany Mountain, contains the shales of Formation V., which contains the fossiliferous ore. This ore, after a long and patient search by Mr. Valentine, of Bellefonte, was at length discovered in this part of the formation, and is used at the Howardville Iron Works. The limestone formation VI., the sandstone VII., the olive slate VIII., and the red sandstone IX., are all in this valley. The latter formation skirts the base of the Alleghany, and is surmounted near the summit by the sandstone of Formation X. Ores of the formations V. VI. have been collected from furnaces having mines in these formations.

14. The collection from the *Mill Hall* (hot-blast charcoal) *Furnace*, Clinton County, Wharton, Morris & Co., consists of pipe ores and hematites of Formation VI., together with the silicious ore of V., and limestone flux from Formation VII., all from localities adjoining the furnace.

Limestone from near Mill Hall (Rogers).—Color, mottled gray and white; sparry; somewhat saccharoidal; fracture irregular; few fossils.

Carbonate of lime	96·80
" magnesia	0·50
Alumina, and oxyd iron	traces.
Insoluble	2·30
Water	0·40
	100·00

The silicious ore is found on the hill behind the furnace, at a distance of 90 rods, and is of cold short character. The pipe ore, according to a communication from Mr. Morris, "yields 60 per cent. of malleable iron in the furnace, and makes a strong iron, used altogether for boiler plate."

15. At Bellefonte, Center county, near the town, is situated the *Logan Furnace* (charcoal cold-blast), and *Bellefonte Rolling Mill and Forge*, of Valentine & Thomas. Their ores are hematites and pipe, and, with the limestone, come from the Kittatinny Valley in the 2d formation. The collection from this furnace is complete in the materials and products, from the ore to the bar, and the Association is indebted to Dr. Franklin Smith, of Bellefonte, for having obtained it from the proprietors of the works.

Bellefonte is a celebrated place for the manufacture of axes. There are four factories in Center county, viz., Mr. Harveyman, Messrs. Wagner & Thomas, Messrs. Loveland & Co., and Messrs. McMullin & Co. These manufacture about 300 dozen of axes a week, using the bar iron of the locality and English cast steel. The grindstones used in the manufacture are very large, and turned by water-power; the stone used for this purpose is found in large quantities in Clinton county, of this State, and is excellent. A specimen of this stone accompanies the collection. Mr. Petriken, of Bellefonte, has contributed a specimen of bituminous coal from Clinton county, on the lands owned by the Rock Cabin Coal Company, situated on the Tangascootack Creek, within five miles of the West Branch Canal, and ten miles of the county-town of Clinton. In the collection from this locality, are also specimens of the hematite from Ross' ore bank formation of Kittatinny Valley. The bed containing the ore is twenty feet in thickness, and rests upon the limestone of Formation II. There are also in the neighborhood of Bellefonte, quarries of hydraulic limestone, from which cement is manufactured; and within eight miles, to the north-west, in the Half-Moon Valley, there is said to be a large deposit of very fine fluor-spar.

16. *Eagle Works*, five miles below Bellefonte, C. & J. Curtin, consist of a cold-blast charcoal furnace, a forge, and a rolling-mill, all using the bituminous coal from Snowshoe, Center county, and which is the same used in all the mills in this district. This coal is situated at the top of the Alleghany Mountain, withia fourteen miles of Bellefonte, and between the Bald Eagle Mountain and the west branch of the Susquehanna. The following analysis is from Rogers' Fifth Report:—Massive; brittle; irregular fracture; tendency to columnar structure; luster, shining jet black.

Volatile matter	21·20
Coke, highly intumescent and spongy	78·80
	100·00

Ashes in the coal, 2·07 per cent.

The ores and limestone flux of the Eagle Works are from Kittatinny Valley; the ore bed varies from five to thirty feet in thickness. White and gray pig metal are made at the furnace, which is wholly manufactured at the works into charcoal blooms and rolled into merchant iron. The furnace averages about 35 tons a week; and 1400 tons were made from Oct., 1851, to Oct., 1852. The iron is used for spades, shovels, and scythes; and the greater portion of it is used in Philadelphia county, though some goes to the East.

17. *The Howard Iron Works* (cold-blast charcoal), Irwin, Thomas & Co., are situated at Howardville, Center county. The collection from these works is very creditable and full, containing everything, from the ore to the merchant iron. The ores used are the hematites and pipe ores of the Kittatinny Valley, south side of Muncy Mountain, and the celebrated fossiliferous ore (called here "Charlie ore") of Formation V., north side of same range. Of the pipe ores, the proportions are 1¾ tons to a ton of metal, which is celebrated for its strength, and for bar-iron purposes. A mixture of the samples from this mine, produces both best pig metal and bar iron. The flux (Formation II.) is from the same locality; the samples of ores in the collection are from a depth of forty feet; the limestone is from the surface. The hematite of the limestone formation of the Kittatinny Valley, from Howard, occurs in a basin, and from within ten feet of the surface to an unknown depth. The deepest shaft that has been sunk—110 feet—has reached neither limestone nor water. It has been worked open for sixty feet, and in no instance has anything else but hematite and pipe ores (lying in large nests) been found. It is unusual in this region to find the two ores so closely united; the pipe ore generally occurs with and following the limestone, even when it is thrown up to the surface. The locality of these ores is near or at the anticlinal axis. The fossiliferous oxyd ("Charlie ore") from the north side of the Muncy Mountain, is found in a bed of from eight to ten inches thick, and dips at an angle of 70°. The vein passes within one-fourth of a mile of the furnace, is easily worked, and will yield 60 per cent. of pig metal.

The flux, as has been already stated, is the limestone of Kittatinny Valley, Formation II. Its dip is nearly vertical, and it runs east and west along the south-east base of Muncy Mountain. It is much crushed in the upheaval, and is readily converted into lime.

The finished iron of the Howard Works is much prized for its malleability and great strength, and is used for smithing purposes, boiler iron, &c. Some of their horse-shoe iron accompanies the collection.

18. *Pennsylvania Furnace* (cold-blast charcoal), *Huntingdon County*, Lyon & Schoab. (The line of Huntingdon and Center counties runs through the furnace stack.)

The ores used at this furnace are from the Kittatinny Valley, and consist of hematites from Floyd's bank, and pipe ores from the furnace banks. The latter lie on an anticlinal axis, within half a mile from the furnace, and between sandstone and limestone. The flux is limestone, Formation II.

Gray, white, and mottled iron are made at this furnace. The white metal is manufactured into blooms at the Catelan Forges, owned by the same Company. The average amount of pig metal made in a blast, which is less than a year, is from 1,800 to 1,900 tons. The Bald Eagle Furnace, belonging to the same Company, uses the hematites, but not the pipe ores. The following analyses of Pennsylvania Furnace ores are from Rogers' Reports:—

Ore from the Bull Bank of Pennsylvania Furnace, Center county.—Hematitic; somewhat mottled; compact; fracture conchoidal; color, chocolate brown.

Silica and insoluble	2·30	
Alumina	trace.	
Peroxyd of iron	86·40	= iron, 60·48 per cent.
Manganese	trace.	
Water	11·00	
Loss	0·30	
	100·00	

Ore from the Old Pennsylvania Furnace Bank, Center county.—Pipe ore; the pipe small, and closely set; color, a dark chestnut brown.

Silica and insoluble	5·03	
Alumina	trace.	
Peroxyd iron	82·02	= iron, 57·54 per cent.
Oxyd of manganese	trace.	
Water	12·00	
Loss	0·05	
	100·00	

19. *The Huntingdon Furnace* (hot-blast charcoal), near Warrior's Mark, Huntingdon county, Geo. K. Schoenberger.

This furnace makes use of the Kittatinny Valley hematite ores, and flux similar to the furnace already described. The localities of the ore beds are in different directions from the furnace, viz.: Dry Hollow, four miles to the north-east. A specimen is sent of beautiful stalactitic, or needle ore, from a bed near the Dry Hollow which has not yet been worked; from the Strain bank, 1¾ miles west from the furnace; and the Wilson ore, 1¼ miles in the same direction. Mr. Hamilton, the manager of the works, communicated the following information. For the year 1849, the average weekly yield by the cold blast was 33¾ tons:—

1850, weekly yield by hot blast	38	tons.
1851, " " "	39¾	"
1852, " " "	40½	"

The year commences with the 1st of April, and the blast lasts for about eleven months. A fine specimen of the white pumice slag from No. 1 iron of this furnace accompanies the collection.

20. *Alleghany Furnace* (charcoal hot-blast), near Hollidaysburg, Blair county, Elias Baker.

The ores used at this furnace are silicious hematites and pipe ores from Logan township, Blair county, and which are found in Formation VI., on an anticlinal axis, between Formations VI. and VII.; and are derived, according to Rogers, from the yellow ferruginous sandstones of the lower strata of Formation VII. Mr. Baker has sent samples of a variety of ores used at the furnace, which differ only in appearance, and which all agree in yielding from 56 to 59 per cent. metallic iron, except No. 1, which gives 61 per cent. The pipe ore, No. 1, is the best adapted to making bar iron; but on account of the uncertainty of mining it, but little is used at this furnace. Nos. 2 and 3 of the collection are considered the best, yielding a superior quality of foundry pig, now almost entirely used for car-wheels, as it chills well and is very strong. Nos. 4 and 5 yield well, but do not work so well in the furnace.

The following analyses of the ores from the Alleghany Furnace, are from Rogers' Fifth Report:—

Alleghany Furnace Ore Bank, six miles from Tuckahoe, Huntingdon county, from near the contact of Formations VI. and VII.—Amorphous; compact; brittle; fracture earthy; color, dark bluish brown.

Silica and insoluble	6·00	
Alumina	trace.	
Peroxyd of iron	82·02	= iron, 57·54 per cent.
Peroxyd of manganese	8·00	
Water	4·00	
	100·00	

Pipe ore from Tuckahoe.—The pipes large; portions of the surface iridescent.

Peroxyd of iron	86·91	= iron, 60·26 per cent.
Alumina	0·22	
Silica and insoluble	1·93	
Water	10·44	
	99·50	

The limestone flux (from Formation VI.) contains 82 per cent. carbonate of lime.

No. 9 is a piece of cinder, made at the blowing in of the furnace, and which, when fluid, so much resembled pig metal, that it was let into the chills.

No. 7 is a specimen of the deposit of oxyd of zinc, called "Cadmia," which collects on the inner walls of the furnace; it contains 82 per cent. of oxyd of zinc.

Rogers gives the analysis of Cadmia from the Mary Ann Furnace, Cumberland county, as follows:—

Oxyd of zinc	92·48
Oxyd of lead	6·48
Peroxyd of iron	1·00
Carbonaceous matter	trace.
	99·96

20. *Springfield Furnace* (hot-blast charcoal), Blair county, D. Goon & Co., have contributed a collection of their ores, flux, slag, and foundry (car-wheel) metal. No information as to the locality of the specimens has been communicated by these contributors.

Rogers gives the following analysis of limestone from near Springfield Furnace, obtained about 400 yards from the base of Lock Mountain:—Color, dull dark-blue; compact, finely grained, somewhat sparry; fracture conchoidal.

Carbonate lime	99·20
Carbonate magnesia	none.
Alumina and oxyd of iron	0·50
Insoluble matter	trace.
Water	0·30
	100·00

We pass now to the consideration of the region of the State west of the Alleghanies, which is taken up here as having been visited next in order, although very valuable eastern sections remain yet to be described. The show from this part of the State is not imposing in point of numbers, but what has been contributed will suffice to exemplify the western manufacture. There is no contribution of ores and minerals from the State fuller than that from Johnstown, nor is there an neat a collection exemplifying the manufacture of iron, as that from the Fairchance Works. The country west of the Alleghanies contains the upper members of the series of deposits, according to Rogers. The strata have been in general but very little disturbed. The Alleghany Mountain in this portion of the State is an elevated table land, the top being two miles in width, and with the south-eastern slope more abrupt than the north-western one. The Conemaugh Valley, in which Johnstown and the furnaces about to be described are situated, is bounded by the Alleghany and the parallel ridge Laurel Hill, through a gap of which the Conemaugh and the Pennsylvania Railroad pass, not far from Johnstown. Johnstown is at present an interesting region to visit, the mining operations and exposure of strata affording much for the observation of the geologist. This valley obtains from formation XI. to the series XIII., containing the coal, among the slates of which occur the beds of argillaceous iron ore—some six or eight in number, but many of which have not yet been fully developed.

22, 23. The furnace at *Johnstown, Cambria county*, Messrs. Bay, Matthew & Co., was undergoing enlargement at the time of visiting. The same firm are working the *Conemaugh Furnace*, which was also undergoing enlargement, distant eight miles below. These are both hot-blast charcoal furnaces, of 10-feet boshes and 40 feet in height; they use the same ores, and have been averaging about 20 tons a week; but when finished a yield is expected of from 40 to 50 tons. The iron made is cold-short, and of superior quality. Both white and gray metal is manufactured, which is used at Pittsburg for forge and foundry purposes. The ore and limestone used at this furnace is taken from the hill immediately behind, and is the same as that used by the Cambria Iron Company. This hill runs east and west, is bounded east and south by the Conemaugh River, and west by Hinkson's Run. The southern face, where are the principal openings, is a mile in length (see map). The strata are nearly horizontal, the inclination being one foot in sixty.

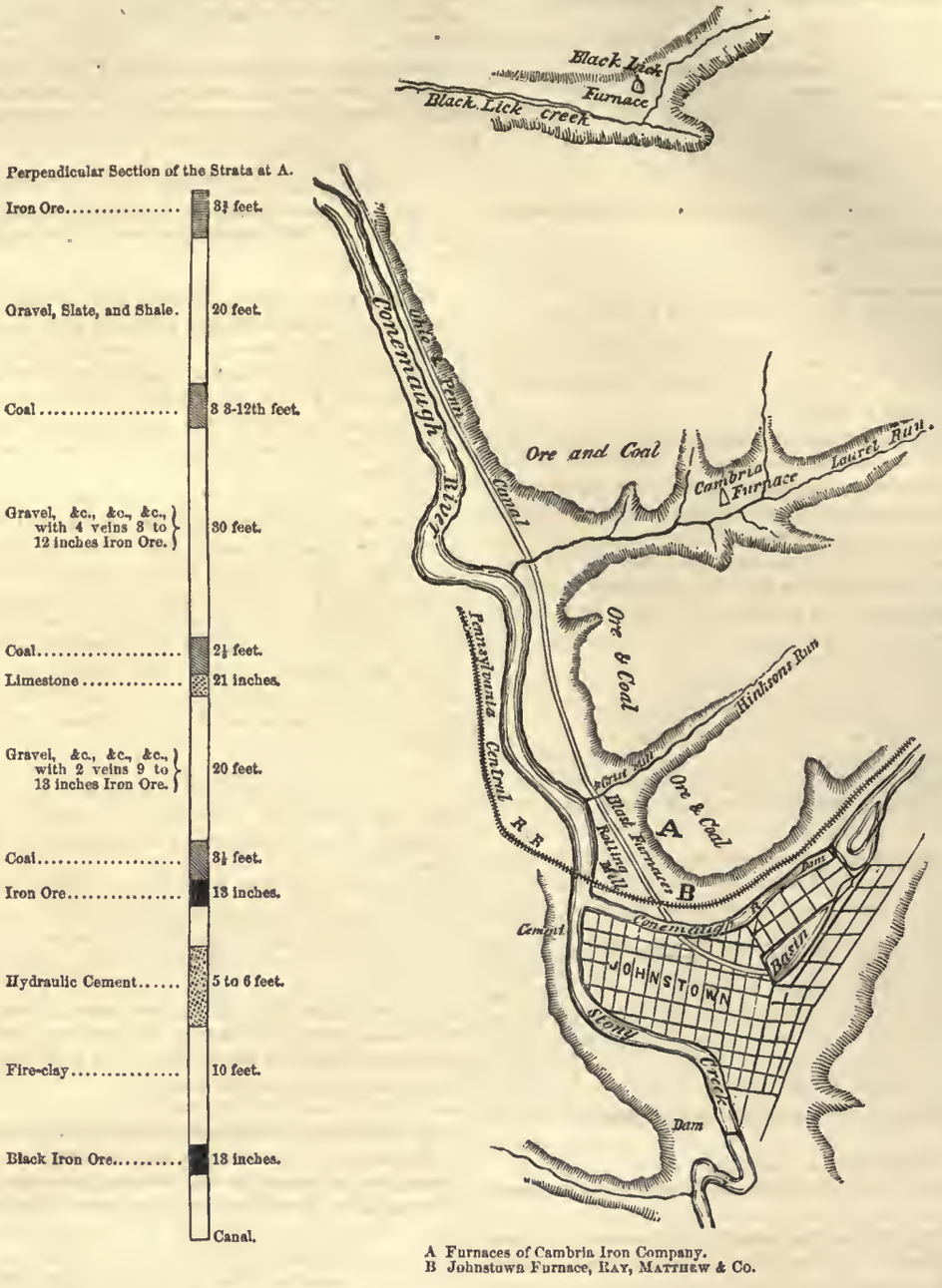
24. The *Cambria Iron Company*, at Johnstown, are making very extensive preparations for doing a large business. With four hot-blast charcoal furnaces in operation, it is purposed to erect four large coke furnaces (two of which are in progress), and a large rolling-mill, the foundations for which were being laid at the time of visiting the region (July, 1853). Johnstown is doubtless destined, from its position and its advantages, both natural and artificial, to become the seat of a great iron manufacture. With all the materials needed for making iron in abundance upon the spot, of superior quality, and most easily to be mined; with a descent from the mines to the trunnel-heads of the furnaces, and from the furnaces to the great avenues of transport, the Pennsylvania Railroad and the State Canal; and with facilities for both an Eastern and a Western market, this region enjoys an enviable position. Reference to the specimens will show that the Cambria Iron Company has made the largest contribution to the Pennsylvania collection. Their contribution has been classified under five heads, viz.:—

(*a.*) Specimens from their lands in general, including ores and materials intended to be used in their four new coke furnaces, and in part used at other furnaces.

(*b, c, d, e.*) The ores and products, respectively, of their four charcoal furnaces in Cambria and Indiana counties.

(*a.*) The lands at the disposition of the Company embrace about 30,000 acres of wood, coal, and ore land. The accompanying map will give an idea of the geological formation of the region, and of the position of the localities about Johnstown. The section, in the map, commences with the great ore-seam; above this is a vein of an entirely different nature, and which has not been much worked. It is said to have made good iron, and is from eighteen inches to two feet thick. The specimen has been placed No. 1 on the Catalogue, and in general the numbers of this part of the Catalogue are in the relative position of the minerals of the collection, as they occur in the earth, proceeding from the top downward. Next is found the great ore-seam, of from 3¾ to 4 feet in thickness. This interesting deposit has been worked for the last ten years, and has yielded in the charcoal furnaces one ton of iron from 2½ to 3 tons of ore. It extends over a large region, and has been proved from two to six miles in every direction from Johnstown, though it is not found in those localities over 18 inches in thickness; and in a northern direction it becomes less rich in metal, and of an inferior quality. At Johnstown it is worked on the southern slope of the

Map of Johnstown, Cambria County.



A Furnaces of Cambria Iron Company.
B Johnstown Furnace, Ray, Matthew & Co.

hill (A, on the map), running back for a mile. The Cambria mine's opening is at the outcrop, near the top of the hill, from which a railroad is constructed to bring the ore down. This ore-seam is inclosed between strata of slate, of which top and bottom specimens are sent. It is also divided into two layers by a stratum of slate, which varies from four to twelve inches. Above this middle slate the ore is coarse, and contains but little lime, while below it, it is fine-grained and with a considerable portion of lime. When the ore of these two divisions of the seam is taken in equal proportions, it will flux in a charcoal furnace without addition of lime. The nature of the ore is that of an argillaceous carbonate, and like such ores the outcrop has been changed by atmospheric influences to an argillaceous oxyd, called shell-ore; where it is heavily covered it is bluish-gray, a carbonate, and is called core-ore. The argillaceous oxyd contains 53 and two-tenths per cent. of iron (Chilton). A little lower, a vein of kidney-ore eight inches thick is found. Next in order, below, is the first or upper coal-seam, 3½ to four feet in thickness. But little of this has been used; it is proposed to convert it into coke (of which a specimen is sent), for the four coke furnaces of the Company. In the 30 feet of shales, slates, &c., below the bituminous coal-seam, are found four veins of iron ore from 8 to 12 inches, of which specimens are sent (specimens 12–15). Below the shale occurs the second seam of coal (specimen 16), 2½ feet in thickness, and immediately beneath this, from 21 inches to four feet of limestone, which is used as a flux in the furnaces of the region, and is proposed to be used in the new coke furnaces.

It is interesting to begin at the opening of the great ore vein at the top of the hill, and, walking down the railroad which is to carry it to the trunnel-heads, to meet next the first coal-vein opening, and lower down the limestone opening, and, having thus seen *in situ* all the materials used in the manufacture, to look still lower, and see spread beneath, the valley where the iron is to be reduced, and along which stretches the railroad and canal which are to carry it off, in the shape of railroad bars, to the extremes of the State.

Below the bed of limestone above mentioned are 20 feet of shales, containing two beds of iron ore from 9 to 13 inches (specimen 17).

Next below is the 3½-feet seam of coal, which is to be coked and used in the new furnaces; specimens of the coke and coal have been sent.

Under the coal is a valuable bed of hydraulic limestone, of five or six feet in thickness. This limestone is opened on the hill on the other side of the river. There are two mills here (Merryman, and Powers & Co.) for the manufacture of cement from this limestone, each of which averages about 100 bushels a day. The cement is supplied to the Alleghany Portage, the Central, the Alleghany Valley railroads, and to other places. Specimens of the cement, in its crude and manufactured state, will be found in the collection.

Immediately under the cement is a bed of fire-clay, of from 10 to 12 feet, and below this, 13 inches of black-band iron ore (specimen 26). This ore is supposed to be of good quality, although it has not yet been worked.

There is another vein of coal, 3½ feet in thickness, still lower than the preceding. A specimen of the conglomerate of this region is sent, which is used for hearthstones in the furnaces.

Specimen 29 is from the outcrop of a large seam of cannel coal, which is believed to be 12 feet in thickness, and which has recently been discovered upon a farm, near the large viaduct of the Portage Railroad, and within four miles of Johnstown.

The hot-blast charcoal furnaces belonging to the Cambria Iron Company are:—

25. (*b.*) *Cambria Furnace, Cambria County* (see map).

26. (c.) *Black-Lick Furnace, Indiana County* (see map).
27. (d.) *Mill Creek Furnace, Cambria County,* and
28. (e.) *Ben's Creek Furnace, Cambria County.*

These are furnaces of eight-feet boshes; and, together, average 120 tons of pig metal a week. They are distant from three to four miles from each other. In the collection are specimens of the ores, materials, and products of these furnaces; the ores and materials being similar to those from this region already described. Near Johnstown, at the place indicated on the map, are 50 acres of bottom land, one-quarter of a mile distant from the town, and between the river and the canal, upon which a large rolling-mill for the manufacture of railroad iron is being erected, nearly 600 feet long by about 200 in width. It is expected, when finished, to make 120 tons of rails per day.

It was proposed to reach, from Pittsburg, the neighboring counties, in which are many furnaces; but the state of the water at the period of the visit, which rendered the transportation of the specimens difficult to be effected in the time allowed, compelled a recourse to circulars, sent to all the Iron Furnaces, 84 in number, and of which but three were answered by specimens, viz., from Pike Furnace, Clarion county; Winfield Furnace, Butler county; and from the Fairchance Iron Works, Fayette county.

All that is to be seen, therefore, from Pittsburg, is the celebrated bituminous coal, to which the city owes its prosperity and its color.

The Pittsburg coal-seam rests on the great bed of limestone; it consists of two seams of coal, divided by a layer of clay, and separated from the limestone by a few inches of blue clay, and is from 5½ to 8 feet in thickness (Rogers). The stratification is nearly horizontal. Professor Rogers has observed the increase in bituminous matter in the coals of Pennsylvania going westward. In his State Reports, it is noted that the first group of coals, from various parts of the basin nearest the Alleghany Mountain, averaged 21 per cent. volatile matter; the next basin to the north-west was somewhat higher; the third range averaged 34 per cent.; and the great western basin of the Alleghany and Monongahela averaged nearly 40 per cent. of bituminous matter. The sulphur present also increases as we proceed westward.

Iron Ore of Clarion County.—In the region of the counties of Clarion and Butler, on and bordering the Alleghany River, there is an important and extensive deposit of ore, which occurs below a formation of shales and sandstones (containing nodular iron ore), and overlying a formation of fossiliferous limestone. Upon this limestone is situated a layer of silicious nature and cellular character, like the buhr-stone of France, impregnated with varying portions of oxyd of iron. The deposit of ore is upon and passes into the buhr-stone, the one abounding where the other is wanting. The ore is a mixture of protocarbonate and peroxyd (the former changing into the latter at the outcrops), and is frequently silicious. The next stratum above the shale is coal.

Rogers gives the following analysis of this ore from Clarion county:—

Peroxyd of iron Carbonate of iron	87·04	= metallic iron, 54·14 per cent.
Alumina	0·05	
Carbonate of lime	4·06	
Silica and insoluble	5·08	
Water	1·05	
	97·28	

The ores from the two following furnaces belong to the above formation.

29. *Pike Furnace* (cold-blast charcoal), Clarion county, Duff & Co.

The ores Nos. 1 and 2, designated on the labels "limestone ore," are said to repose upon a stratum of limestone, of about five feet in thickness, and which itself varies from six to twelve inches. The kidney-ore, which is sometimes used at this furnace, is found at different localities in the neighborhood. Coal is sent with the collection, occurring in two seams above the ore. The stratum of bituminous coal is 4½ feet thick, and cannel coal is found in spots of from seven to twelve feet in thickness. Specimens of pig metal, slags, and the flux used in the furnace (which is from the stratum of limestone under the ore), are also contributed. The collection is accompanied by a section showing the position of the beds of slate, ore, and coal.

30. *Winfield Furnace* (charcoal cold-blast), Butler county, Wm. L. Spear.

The ore, designated No. 1 in the Catalogue, is found in a stratum of from eight to twelve inches in thickness, and upon the limestone. This is thought to be the most productive ore, and produces a superior iron.

The ore No. 2 is found 100 feet above the preceding. At its outcrop it measures twelve inches, but at a distance of fifty yards in the hill, where it is now worked, it has thickened to four feet. Though not very rich, this is an esteemed ore, being the more profitable to work, since, on account of its porous condition, it requires less fuel to make a ton of metal.

No. 3 is found with the others in the same hill, thirty feet above No. 2, and in a stratum five feet in thickness. When first taken out, and before having been exposed to the action of the weather, the ore presents much the appearance of limestone. It is considered a valuable ore to work with the silicious ore No. 2, and is supposed to owe this property to lime which it contains. When mixed in the proportion of one-third with No. 2, a very fluid slag results, and a fine iron. If this proportion be exceeded, the appearance of the slag does not change, but hard white iron is produced.

We have specimens of foundry and forge metal, with their corresponding slags, made from the ores 2 and 3. Sixty pounds of limestone are required to flux 1,000 lbs. of ore.

The specimen of coal, No. 7 in the Catalogue, is from a stratum five feet in thickness. Coal No. 8 of Catalogue is four feet thick, and sixty feet above the preceding coal seam.

The stratum of limestone is twenty-five feet thick, and twelve feet above the first coal seam.

These minerals all occur conveniently to the furnace, and are opened upon the south-west side of the hill. As they are found in the same order upon the north-east side of the same hill, they are estimated to extend three-fourths of a mile through the hill, and can be found without any difficulty at any places of the same level within three miles of the furnace.

About fifty tons per week of charcoal pig are yielded at this furnace. The metal has to suffer the inconvenience of an eight-miles land-carriage to the Pennsylvania Canal, which will be obviated when the North-Western Railroad, which passes the furnace, is completed.

31. *Fairchance Iron Works*, Fayette county, F. H. Oliphant.

This complete little collection well exemplifies the manufacture, from the ore to the variously finished merchant iron, and with specimens illustrating the texture of the material and appearance when bent, both hot and cold. The ore is argillaceous, and the flux is in the proportion of 100 lbs. of limestone to 2,000 lbs. of ore. The pig metal is charcoal cold-blast. There are no squeezers nor muck rolls used at the mill, the iron from the boiling furnaces being hammered into slabs for nails, and into blooms for bars.

Recrossing the Alleghanies, the next locality visited was Harrisburg.

32. *The Harrisburg Anthracite Furnace*, Gov. D. R. Porter, uses the magnetic ore from Lebanon county, together with hematites from Cumberland and York counties, specimens of which are in the collection. The Cornwall ore, from Lebanon county, is an ore much esteemed and used by a number of furnaces which have access to it. Its position is in the red sandstone formation (Middle Secondary of Rogers), in the vicinity of a trap dike, where it occurs in large masses or hills. It is found with copper, and much of it is mingled with pyrites. It is used in the furnace in two forms—soft, or pulverulent, and a dense variety. (See specimens.) The following analysis is given by Rogers:—

Magnetic ore from Cornwall Mine, Lebanon county. Description.—Nearly black; aspect dull, with brilliant points; somewhat cellular; the little cavities containing small octahedral crystals of magnetic oxyd, and also a whitish asbestiform mineral. The ore possesses magnetic polarity. The water is probably hygrometric.

Magnetic oxyd of iron	97·99	= iron, 70·34 per cent.
Alumina	0·84	
Silica and insoluble	0·24	
Water	0·12	
	99·19	

The Cumberland Valley is a prolongation of the Kittatinny Valley, which has already been described, when noting the furnaces in the neighborhood of Reading, as embracing the limestone formation No. II. and the slate formation III. The hematite occurs in nests in clay upon this limestone; that occurring at the junction of the limestone with the sandstone formation I., is a cold short ore, containing manganese.

The Harrisburg Furnace uses Cumberland Valley ore from near Shippensburg. The following analysis of the Cumberland county hematite is from Rogers' Fourth Report:—

From the old diggings at Pilgrim bank, north-east from Shippensburg.—Structure, closely adhering, almost obliterated pipes; color, chestnut brown.

Silica and insoluble	6·08	
Alumina	4·00	
Peroxyd of iron	77·07	= iron, 54·39 per cent.
Water	11·00	
Loss	0·05	
	100·00	

The limestone used as a flux in this furnace is from this formation of Cumberland Valley, being obtained at the distance of a mile and a half from the furnace, on the railroad from Bridgeport to York.

The York county ores are from Pigeon Hill and Jefferson. These occur in limestone formation II. of the York Valley, and are similar to those already described. The Pigeon Hills are the slates and sandstones of Formation I. rising through the limestone formation of the York Valley. The pumice cinder is from No. 1 iron, made from Chestnut Hill ore, which is not now used at the furnace.

The sandstone hearth of this furnace is from Rausch's Gap, thirty miles from Harrisburg. The fuel used is the anthracite of the Wyoming basin, of which several varieties are employed, and, among others, those from Cooper's and Wadhan's veins, of which specimens are sent.

The three different kinds of iron are made at the Harrisburg Furnace, although lately but little foundry iron has been smelted. The average of pig metal manufactured throughout the year is at the rate of 83 tons a week, and is mostly used in Pittsburg for forge purposes. Since last November, 1,300 tons were sold in Pittsburg.

The following interesting group of furnaces, in Lancaster county, between Columbia and Marietta, were next visited:—

The Henry Clay, Haldeman & Small; *Chickiswalungo*, Dr. E. Haldeman & Co.; *Donegal*, Eckert & Stein; and *The Marietta Furnaces* of Schoenberger, Musselman & Co.

They employ the ores of the locality from Formations I. and II., and some furnaces use the Cornwall ore. The fuel is the Wyoming anthracite of the Baltimore Coal Company, and the flux, the limestone of Formation II. This limestone formation is invaded, between Columbia and Marietta, by a ridge of hills of the sandstone formation I. A specimen of this sandstone is sent from the Chickiswalungo Furnace, where it occurs. Upon this sandstone, at Chestnut Hill, is found the celebrated hematite ore of that name. "It lies (Rogers) in a basin-shaped depression in the rock, and is sometimes confusedly mixed with sand, clay, and steatitic matter, and sometimes lies, surrounded by a less proportion of foreign matter, in nearly horizontal beds." It is a cold short ore.

Rogers gives the following analysis of ore from Chestnut Hill, near Columbia, Lancaster county, in Formation I.:—Brown; compact; surface mamillary; outer portions of the mass crystalline and radiated. The analysis was performed upon a piece representing the average of the mass.

Peroxyd of iron.....	34·39	= iron, 58·51 per cent.
Alumina.....	2·46	
Silica and insoluble.....	2·38	
Water.....	10·99	
	100·22	

33. *The Henry Clay Furnace* uses the coarse and fine varieties of the Cornwall ore, together with the hematite from Chestnut Hill. The limestone is from the mouth of the Chickiswalungo Creek, 300 yards from the furnace up the Susquehanna. The furnace averages 75 tons a week at present.

34. *The Chickiswalungo Furnace*, the next on the river adjoining the Henry Clay, uses Cornwall and Chestnut Hill ores, together with a hematite from their own mine near Chestnut Hill, which is a red short ore, and occurs in nests in clay upon the limestone formation II.

The hematites from Chestnut Hill, and from Haldeman's Mine, in this collection, are very fine. Professor S. S. Haldeman has contributed specimens of Chestnut Hill hematite containing a compound of arsenic, and another from within seven miles of Allentown. There are also crystallized slags, from the Chickiswalungo Furnace, of a stellated form, and a fine specimen of "kish," or artificial graphite.

The furnace has been making 65 tons of metal a week, and is enlarging to 90 tons.

35. *The Donegal Furnace*, near Marietta, uses Chestnut Hill and Cornwall ores. Its dimension is 11-feet boshes, having been enlarged one foot since 1849. From 83 to 90 tons of the different varieties of pig metal are made per week, which, this season, goes nearly all to Pittsburg.

36, 37. *The two Marietta Furnaces* of Schoenberger, Musselman & Co. use the hematites of Sherks' and Clarke's ore banks, and the Stoner hematite of York county, which is argillaceous, and situated in detritus from a sandstone hill. They estimate their present yield at 7,000 tons of white, gray, and mottled metal per year, which is sent to Baltimore and Pittsburg, though there is also a large local custom.

38. *Safe Harbor Iron Works, Lancaster County*, Reeves, Abbott & Co.

These works, situated on the Susquehanna, nine miles from Lancaster, and about the same distance below Columbia, were commenced in 1847, and consist of an anthracite furnace of fourteen-feet puddling furnaces, and a rail mill—together with a foundry, and pattern and machine shops, of a capacity for manufacturing every thing, including brass castings, necessary to the machinery, etc., of the works. The pig metal, which is of the varieties 2 and 3, averages 100 tons a week, and is all used at the works for rails, together with about 200 tons a week purchased from the Shawnee, Chulasky, and Franklin Furnaces, near Danville. The present average product of rails per week is 280 tons; of these, 1,000 tons per month go to the Pennsylvania Railroad, and the remainder to the railroad of the Commonwealth.

Twelve additional puddling furnaces, of improved construction, are being erected, and two additional heating furnaces, which will increase the capacity of the works fifty per cent. During the present year, ending with the 1st of April, 1854, it is expected that 14,000 tons of rails will have been made.

For puddling, the bituminous coal of Hollidaysburg is used. For the heating furnaces, and for the blast furnace, the Wyoming Valley anthracite, from several Companies at Nanticoke, Wilkesbarre, Plymouth, and Pittston (of which a collection is sent), is employed. The furnace hearth is of fire-brick, made by the Company, from fire-clay, at their works at North-East, Cecil county, in Maryland. The limestone flux is obtained from the Conestoga Creek, from one to three miles distant from the furnace.

The ores used, six in number, are all hematites, and all slightly silicious. Their geological position is the same, being found in nests in Formation I., with the Limestone II. on the north side, and the mica slate of the metamorphic rocks on the south. These ores are as follows:—

1st. Buckwalter's—a rather silicious, cold short ore, occurring about half a mile to the west of the furnace.

2d. Rathfou's; not a cold short ore; occurs 600 feet to the west of the rolling-mill. The deposit here has the appearance of a vein, eleven feet thick, in a position nearly vertical between the mica slate and limestone, and has been traced by its outcrops east and west for nearly half a mile.

3d. Kendig's is similar to No. 2, and occurs, in the same manner, two miles east of the rolling-mill.

4th. Hopkins'; slightly cold short, and rather more silicious than 2 and 3; is 2¼ miles to the south-east from the rolling-mill.

5th. Good's; occurs one mile south-east from the rolling-mill, and is slightly silicious, but not cold short.

6th. Gontner's is found near the Hopkins ore, which it resembles very much.

With mixtures of these ores, to which the mill slags are added, 2⅝ tons are required for a ton of iron.

The hematite deposit of this part of Lancaster county has been traced, here and there, along a zone of country about two miles in width, commencing at Safe Harbor and extending for perhaps twelve miles. It has been proposed to connect Columbia and Westchester by a railroad, which would pass through this region, and would greatly develop its ores, as many of them are now inaccessible.

39. *Conowingo Furnace* (cold-blast charcoal), Lancaster county, Jas. M. Hopkins.

The ore used here is a brown hematite from the Conowingo Mine, Bart township, five miles north of the furnace in Bart township. The ore and its geological position are the same as those of the Safe Harbor Works, already described. The limestone is to the east, and the dip is west, at an angle of 60°. The mine is an open bank; it was commenced at about four feet from the surface, and has now reached a depth of 80 feet, and is, where worked, from 60 to 80 feet in width. The water which is discharged from the mine amounts to 200 gallons per minute. This ore, which is neither cold nor red short, is worked raw, and yields in the furnace about 40 per cent. of metal. The iron is sold for car-wheels, and is esteemed for its equal chilling; it is also used for boiler-plate, and is found of great advantage to mix with Coleman's Cornwall iron for blooms.

The iron made here, which is principally lively gray, and forge metal, averages 25 tons a week, and is used in Philadelphia, and at the forges in the neighborhood of the furnace.

The limestone flux is obtained from the banks of Beaver Creek, Strasburg township, eight miles north from the works.

The conglomerate used for the hearth is brought from the Forest, Berks county, near Morgantown.

Ores of lead, copper, zinc, and nickel from Lancaster.—From Lancaster Mr. E. S. Husley and Mr. R. Clarkson have contributed minerals of lead, zinc, and copper from the neighborhood. Two of these mines, within half a square of each other, are five miles distant from Lancaster (upon the Harrisburg turnpike), upon Chestnut Hill ridge. They are at present held by a New York Company, who expect shortly to mine them extensively. The silicate of zinc at this place was once quarried for the purpose of *mending the turnpike!*

The Gap Mine, which yields copper pyrites containing nickel, is distant twenty miles from Lancaster. In this part of the collection are specimens of this pyrites from Mr. Hubley, and also one from Dr Genth, who analyzed it. Dr. Genth found that "the Gap specimens containing actinolite were the richest in copper. The purest nickel ores do not contain more than 3 per cent. of nickel. The average ores, without copper pyrites, contain by analysis 1½ per cent., and those with copper pyrites give nickel 0·6; copper 12·9; and gangue 36·5 per cent."

The remaining furnaces are those in the neighborhood of Philadelphia:

40. *Phœnixville Iron Works, Chester County*, Reeves, Buck & Co.—These iron works at Phœnixville have in operation three anthracite furnaces, which together yield weekly 250 tons of pig metal. This is puddled and converted into rails by extensive furnaces and mills. The present yield of rails is 1000 tons a month, though over 1200 tons have been made. Extensive improvements are going on at these works, among which are furnaces for the preparation of wrought iron, direct from the ores, and arrangements for the manufacture of merchant iron. The fuel used is hard white ash anthracite from Tamaqua. The flux is blue and white limestone from Cranford's quarry, below Norristown. The charge is raised to the trunnel head of the furnace by balancing by water, a reservoir of which at the top of the furnace is supplied by the engine. The hot gases are conducted to the surface of the ground where the boilers are placed. The ores in use at these furnaces are in great variety; they comprise magnetic ores from Cornwall, Jones, French Creek, Warwick, Oakley's (at Reading), and Boyerstown. These ores have all been previously described, with the exception of that from Boyerstown. This ore is from Berks county, and is situated in the red sandstone formation near a trap dike, and near its contact with the primary rocks of the South Mountain. The following analysis is from Rogers' Report:—

Color, dark dull-gray, approaching black, with glimmering crystalline points; powder, black; effervesces very slightly by an acid; contains some green chloritic clay; acts on the magnetic needle.

Magnetic oxyd of iron....	86·67	= iron, 62·22 per cent.
Alumina.....	1·36	
Carbonate of lime	0·80	
Magnesia	2·60	
Silica and insoluble.....	7·72	
Water.....	0·80	
	99·95	

There is also a magnetic ore used here which has already occurred in the collection, although it has not been described, viz.: Green's ore at Isabella Furnace, West Nantmeal township, Chester county. This ore is titaniferous, and occurs as a vein in gneiss rock. Is of a dark color, metallic luster, clevage foliated, sometimes granular, and has polarity. Its density is 4·95, and composition (State Reports)—

Titanic acid	22·39	
Protoxyd of iron	76·86	= iron, 59·44 per cent.
Loss	0·75	
	100·00	

These magnetic ores are mixed with the following hematites:—1st. Roudenbusch's, Berks county (see Dr. Hiester's Map). This ore occurs, in nests, in the Formation L 2d. Yellow Springs (Chester county), hematite. This ore has the usual appearance, but is of resinous luster. It occurs in a ferruginous loam, upon gneiss rock. The following is its analysis, from the State Reports:—

Peroxyd of iron	82·91	= iron, 57·55 per cent.
Alumina	1·35	
Water	13·90	
Silica and insoluble	3·32	
	101·48	

3d. Hematite from Spring Mills, which occurs in the Limestone I. of the Great Valley, in nests of clay, and in some places with earthy plumbago and dentoxyd of manganese.

The remaining furnaces to be noted are in Montgomery county, below Norristown, near to each other, and form a natural group, using the ores of Montgomery county, with the exception of the Swede Furnace, which uses other ores in addition. These hematites, opened in so many places, are all similar to the Spring Mill ore, and occur like that ore, though they vary in quality, some being more silicious than others. Their fuel is anthracite, from the Pottsville region, and their flux scraps, from the blue and white marble quarries of the neighborhood.

41. The *Spring Mill Furnace*, David Reese, had just blown in at the time of visiting it, and was producing from 70 to 80 tons of pig metal per week. The marble flux is from David Potts' quarry; the coal from Ratcliff & Co., and from J. & R. Carter. The ores sent are very beautiful, and well illustrate the variety of form of the hematites of this region. The ores are obtained from the following banks: David Reeves' mine, White Penn township, near Flowertown; William Coulston's, near Flowertown; Rex's mine, Springfield; Hitner's, Kirkner's, Andrew Fil's, and Lentz's, all in Whitemarsh; Kunzi's & Potts' mines, Plymouth; and Ottinger's mine, Springfield.

In this collection is placed a specimen of the ore of the Durham Furnace, contributed by Mr. Rites. This ore is from an injected magnetic vein in the gneiss of the South Mountain, at Durham, on the Delaware.

42. The *Plymouth and Merion Furnaces*, at Conshohocken, are both worked by the same firm, S. Colwell & Co. Mr. J. B. Roberts, the Director, has sent their collections. The Plymouth uses hematites from Markley's mine, Plymouth; Woods, Whitemarsh & Treacy's (pipe ore), Penn township. The flux of the furnaces is from Hocker's quarry, Whitemarsh, and the fuel from the Forest Improvement, and from other Companies. The specimens sent are average working ones of the furnaces; all the ores are washed, and thus yield from 38 to 40 per cent. in the furnaces. At this furnace is a foundry for casting the large main water-pipes of Philadelphia. The average weekly yield of the Plymouth is from 65 to 70 tons. The Merion hematites are from Hitner's, Whitemarsh, from Freedly's, Plymouth, and from Rambo's and Dehaven's, Merion townships. The weekly yield of this furnace is from 90 to 95 tons.

43. *The Swede Iron Company*, below Norristown, on the opposite side of the river, have two large furnaces in operation, and are erecting a third, of 14-feet boshes and 52 feet in height, which is expected to go into operation by the 1st of September. The boilers of these furnaces are heated by the blast-furnaces, and are situated at the trunnel-head, where they are supported by arches. The present average per week for each furnace is 120 tons, the market for which pig metal is in Philadelphia. The coal is white ash, from L. C. Dougherty, Clarkson, Davis, Charles Miller, &c., Schuylkill county.

The ores used are the Cornwall magnetic oxyd, and the magnetic ore of Serpentine Ridge, Chester county, near West Chester, in addition to the hematites of the already described formation. These are from the Swede Iron Company's mines, situated at Limestone Ridge, a mile and a quarter westward from the furnace, and are to be connected with it by a short rail now being built. The Ridge runs east and west, and the ore is in nests, in the superincumbent clay. Hematite from the Slate Hills, a mile and a half south-west from the furnace, is also used. The deposits of this ore lie between traps and limestone. We have also from this furnace five specimens of iron and slags, some of which are crystalline. The spun glass slag (19 of Catalogue) recalls certain varieties of lavas. It is blown out into threads by the blast, and indicates No. 1 iron. We have this slag also, and in finer fiber, from the Johnstown Furnace. There is also a fine specimen of *kish*, or artificial graphite, from the Swede Company. No. 33 is a curious piece of iron from the slag, which shows a tendency to crystallization in large octahedra.

Crystallized minerals as furnace products.—No. 31 is a piece of metal, covered in parts with short fibrous crystals, made under peculiar circumstances. The furnace was working very badly, was without boshes, and just about going out of blast. Where the pigs were broken from the sows, white fumes arose, the condensation of which is supposed to have given rise to these crystals.

The crystals are white, opaque, and of satin luster, composed of bunches of fibers, some of which are square at the extremities, others pointed. In water, under the microscope, they are translucent. Adhering to, and entangled in these, are exceedingly small globules of white iron. They are easily pulverized in an agate mortar, and, when heated before the blow-pipe, emit a bright light (without tinging the outer flame either full yellow or purple), and experience semi-fusion. In a bead of borax, the reactions of iron takes place; and, with carbonate of soda and niter, that of manganese. In hydrochloric acid, but little is dissolved, leaving the forms of the crystals; the iron globules of course dissolved with evolution of hydrogen. A small portion was analyzed by the moist way; and, after fusion by carbonate of soda (which was colored intensely green), silica, alumina, iron, manganese, lime, and magnesia, were detected. This interesting substance merits a further examination, if it were possible to obtain enough of it; and, without a quantitative analysis, it would of course be premature to decide to what mineral it corresponds. From its appearance and reactions, it would appear to belong to that variety of hornblende called "tremolite;" and which appears the more probable, since several crystalline slags have been shown, upon analysis, to belong to the augitic or hornblendic classes. There are, in several parts of this collection, crystalline slags from blast-furnaces. They are of three different appearances:—1st. Short square prisms, of a "stone" color, with the angles replaced; with planes making equal angles with the adjacent faces, as l. q. in the contribution from the Allentown Furnace. 2d. Drusy cavities, filled with short tabular crystals, and of different shades of color, as from the Crane Furnaces and elsewhere; and 3dly. Long slender prisms, grouped in stars or radiating from a center, as in the slags from the Chickiswalungo Furnace. The crystalline blast-furnace slags of Pennsylvania have not been as carefully examined, as those of the English furnaces, by Dr. Percy (Ch. Gaz. v. p. 293). Dr. Percy infers, from a series of five slags, having an appearance similar to No. 1 above, the formula of Al_2O_3, $SiO_3 + 2$ (3(Ca, Mg, Mn, Fe) O, SiO_3); which approximates to the formula of the mineral called Vesuvian.*

Dr. Percy gives, in his Memoir, the results of an examination of slags from furnaces on the Rhine; one of these contains a drusy cavity, filled with crystals, belonging apparently to the oblique prismatic system, being composed of bisilicates, and approximating to some varieties of augite, containing alumina.

A specimen of slag is exhibited resulting by the remelting of cast-iron with lime in a small cupola, consisting of a pearl gray mass, with long yellow crystals imbedded therein, which were square prisms with the angles truncated, and connected in radiating groups. The analysis of this slag led to the formula of the species Humboldtilite.

All of these minerals are found in the lavas of active volcanos; and, indeed, between these lavas and the slags of blast-furnaces, there are many points of resemblance, both physically and chemically, and the two have of late years thrown much light upon each other. Berthier (Essais par la voie sèche) has made a number of analyses of furnace slags, found during different phases of working of the furnace.

Conclusion.—Prospects of the Iron Manufacture.

The present prospects of this important manufacture in Pennsylvania are very encouraging. Every where is found the greatest activity; old furnaces are increasing their capacity and building additional stacks, while new Companies are starting into existence and emulating their predecessors. In 1850, when the iron manufacture was suffering under a depression, Mr. Charles E. Smith traveled through the State, for the purpose of collecting the valuable information which is embodied in his statistics. We have already selected from his tables the information concerning the furnaces contributing to this collection, and this article will close with further observations on the general state of the manufacture in 1850, drawn from the same source.

Of the 62 counties in the State, there were then 45 containing iron works; of the 17 containing no such works, nine possess abundance of ore and coal, which are only waiting for a cheap road to market. The following Table illustrates the production of iron from the ore:—

Production of Iron from the Ore.

		No.	Investment.	Present Capacity. Tons.	Make 1847. Tons.	Make 1849. Tons.
Furnaces using	Anthracite Coal	57	$3,221,000	221,400	151,331	109,168
	Bituminous Coal	7	223,000	12,600	7,800	4,900
	Coke	4	800,000	12,000	10,000	
	Charcoal, hot-blast	85	3,478,500	130,705	94,519	58,302
	Charcoal, cold-blast	145	5,170,376	173,654	125,155	80,665
	Bloomeries	6	28,700	600	545	335
Total		304	$12,921,576	550,959	389,350	253,370

Conversion of Cast into Wrought Iron.

	New Works.	Investment.	No. Forge Fires.	No. puddling for.	Capacity. Tons.	Actual Make 1847—Tons.	Actual Make 1849.
Charcoal Forges.	121	$2,026,300	402		50,250†	39,997	28,495
Rolling Mills	79	5,554,200		436	174,400‡	163,760	108,358
Total	200	$7,580,500	402	436	224,650	203,727	136,853

* The beautiful crystallized slags from Easton may be here alluded to. They were collected by Dr. Swift, of Easton, and exhibited by Professor B. Silliman, Jr. They have not been accurately studied, but it is easy to recognize among them beautiful highly polished crystals (oblique prismatic), sometimes transparent, probably augite, and opake, light-brown colored, hexagonal forms, probably idocrase.—Eds.

† 402 fires, at 125 tons per fire per annum.

‡ 436 furnaces, at 400 tons per furnace per annum. Of the rolling-mills, there were six nail-mills. The total number of nail machines in the State was 606. Each machine averages 1,000 kegs of 100 lbs. per annum, making yearly 606,000 kegs, or 30,300 tons.

Two-thirds of the product of the forges is sold in blooms to the rolling-mills, for the manufacture of boiler-plate, horse-shoe bar, and bars for cutting-instruments; the remaining third is sold as hammered bar iron, in competition with the Swedish and Russian article.

Table showing all the Works in the State, in 1849, engaged in the Conversion of Iron into Steel.

	County.	Situation of Works.	Owners.	Tons annually converted.
Eastern Penn.	Philadelphia	Kensington	James Howland & Co.	600
	"	"	T. Robbins	500
	"	"	Earp & Brink	100
	"	"	Robert S. Johnson	400
	"	Oxford	W. & H. Rowland	700
	Lancaster	Mortio	R. & G. D. Coleman	400
	York	Castlefin	R. W. & W. Coleman	100
Western Penn.	Alleghany	Pittsburg	Singer, Hartman & Co.	700
	"	"	Coleman, Hailman & Co.	800
	"	"	Jones & Quigg	1,200
	"	"	Spang & Co.	200
	"	"	G. & J. H. Schoenberger	200
	"	"	S. McKelvy*	178
	Total Tons.			6,078

* Have been in operation six months; 44 tons of the above amount is cast-steel.

The total number of iron works of all kinds in the State in 1850 was 504

Capital invested in lands, buildings, and machinery, directly dependent on the iron works for their value $20,502,076

The number of men employed 30,103

The number of horses 13,562

The consumption of fuel in all the iron works of the State in 1847 was, anthracite coal, 433,000 tons, at average of $3.00 per ton $1,449,000

Bituminous coal, 2,007,600 bushels, at $5.00 450,880

Wood (at a price which would convert it into charcoal, and deliver it at the furnace), 1,490,252 cords, at $2.00 2,980,504

$4,879,880

Table showing the number of Iron Works constructed for every period of ten years from 1730 to 1850.

	Blast Furnaces.		Bloomeries, Forges and Rolling Mills.	Total of all kinds.
	Mineral Coal.	Charcoal.		
10 years, ending June 1st, 1730	.....	.....	1	1
" " " " 1740	.....	1	1	2
" " " " 1750	.....	2	1	3
" " " " 1760	.....	2	5	7
" " " " 1770				
" " " " 1780	.....	3	2	5
" " " " 1790	.....	1	4	5
" " " " 1800	.....	9	16	25
" " " " 1810	.....	11	19	30
" " " " 1820	.....	14	16	30
" " " " 1830	1	18	30	49
" " " " 1840*	5	72	46	123
During the year.....1840	3	3	6	12
" " 1841	1	3	2	6
" " 1842	5	8	7	20
" " 1843	.....	5	2	7
" " 1844	4	13	4	21
" " 1845	14	15	11	40
" " 1846	11	30	12	53
" " 1847	8	12	5	25
" " 1848	5	6	6	17
" " 1849	3	2	5	10
Four months in 1850	3	.....	4	7
Unfinished at that time	5	.....	1	6
Total	63	230	206	504

* Two years prior to 1840 the value of anthracite for making iron was discovered.

SECTION I. CLASS II.

CHEMICAL AND PHARMACEUTICAL PRODUCTS AND PROCESSES.

INTRODUCTORY NOTE.

The chemical arts are comparatively in their infancy in the United States, but have, nevertheless, already assumed much commercial importance. Vast quantities of the mineral acids, of alum, and various salts used in dyeing, are not only made upon the Atlantic sea-board, but very flourishing establishments of this sort have arisen in the valley of the Ohio. The absence of all internal imposts, or restrictions, has had the effect to stimulate some branches of chemical industry to a great extent. Thus, alcohol is distilled at a cheaper rate for general manufacturing purposes in the United States, than in any of the European states.

The more refined and difficult departments of manufacturing chemistry, required for the proper preparation of pharmaceutical products and chemically pure reagents, have been by no means neglected in the United States, as a reference to No. 1, of this class, will show; and many other exhibitors bear testimony to the same fact.

The abundance of *chromic iron* in the United States, has led to the establishment of several manufactories of the chrome colors, the most important of which is that of Tyson, in Baltimore.

In no country, perhaps, is less attention bestowed upon the proper economy of manufactures in saving or utilizing the effete or waste products of various processes. A single example will illustrate this assertion. The coal tar and ammonia water, obtained in the manufacture of coal gas, are nearly all thrown away for want of a market. Although it is well known that the one contains benzole, paraffine, naphthaline, and various other valuable products, and that the latter is one of the most valuable of all manures.

This is not from ignorance, as the facts are well known, but it must arise from the greater gains to be secured by following other branches of industry. With the increase of population, these evils will be remedied.

The almost total waste of the bittern, or mother water of the salines, in Virginia and Kentucky, although they are known to be rich in bromine, is another fact of the same sort. Nor is any better use made of the vast quantities of petroleum, or rock oil, which, in some of the salines, is so abundantly discharged with the salt water of the Artesian wells.

The direct dependence of many important branches of industry upon chemical manufactures, cannot be questioned, nor does it need any amplification.

The most complete display of chemical and pharmaceutical products in the Exhibition, was undoubtedly that from Gehe & Co., of Dresden, and included (as may be seen by reference to it), many substances very rarely seen, even by chemists. It was also most accurately and fully displayed with great taste and skill.

This class, although not a large one, was rather numerously represented in the Exhibition, and was regarded as very interesting and instructive.

UNITED STATES.

I.—Powers & Weightman, *Philadelphia, Pennsylvania*—Manufacturers.

CHEMICAL AND PHARMACEUTICAL PREPARATIONS.

Phosphate, precipitated carbonate, citrate, sulphate, dried sulphate, sulphide, valerate, iodide, lactate, and tannate of iron. Citrate of iron and quinine, tartrate of iron and ammonia, tartrate of iron and potash, iron reduced by hydrogen, and ammonio-chloride of iron.

Cyanide, arseniate, arsenite, iodide, suboxide, and sulphate of copper. Nitrate, iodide, iodate, and acetate of lead. Sulphate, carbonate, acetate, cyanide, ferrocyanide, and chloride of zinc. Nitrate of silver. Protochloride, subchloride, red oxide, cyanide, red iodide, black sulphide, and red sulphide of mercury; *hydrargyrum cum creta;* crystallized calomel. Ammonio-chloride of mercury; tartar emetic in powder, and in large crystals; precipitated sulphide of antimony; subnitrate, oxichloride, and valerate of bismuth; oxalate, phosphate, and arseniate of ammonia; sulphate and carbonate of manganese; sulphate of cadmium.

Carbonate, bicarbonate, acetate, hydrate, and citrate of potash; cyanide, sulphide, and bromide of potassium; phosphate of soda; phosphate of soda and ammonia; nitrate of strontia; chloride of strontium; kermes mineral (precipitated sulphide of antimony); sal-prunella (fused saltpetre); sal-acetosella; precipitated phosphate of lime; nitrate of baryta; chloride of barium; iodide of sulphur; crystallized sulphur; alum; large crystals of tartaric acid; tartaric acid in powder; Seidlitz powders; Rochelle salt (tartrate of potash and soda); sulphate of magnesia (Epsom salt); sulphate of iron (copperas); tannate of alumina.

Morphine, sulphate of morphine in lumps, and in powder; valerate, acetate, and chlorohydrate of morphine; citric and gallic acids; cinchonine, and sulphate of cinchonine; brucine and sulphate of brucine; santonine; picrotoxine; pure quinine; arseniate, iodate citrate, sulphate, bisulphate, chlorohydrate, acetate, valerate, and ferrocyanohydrate of quinine; strychnine in white powder, and in yellowish crystals: acetate and nitrate of strychnine; caffeine and theine; menispermine; meconine; tannic acid.

Acetonie; chloroform; aromatic spirits of ammonia; spirits of ammonia; aqua ammonia FFF.; concentrated liquor of ammonia; oil of vitriol; concentrated pure sulphuric, chlorohydric, and nitric acids; aquafortis and "parting acid;" commercial muriatic acid; butyric, lactic and valeric acids; chloric ether; acetic ether; spirits of nitrous ether (mixture of nitrite of oxide of ethyle, alcohol and water); commercial and concentrated sulphuric ether; butyric ether; butyraceous ether; essential oils of cubebs, caraway, copaiva, cloves, black pepper, and pimento or allspice; commercial alcohol; deodorized alcohol; Fowler's solution; Donovan's solution.

[The preparations of *iron* are called in medicine *hæmatinics*, from the effect which they have upon the composition of the blood, when administered internally. The substance

which gives the red color to the blood, called by chemists *hæmatine*, is a compound of iron, containing six and a half per cent. of this metal; the blood itself containing about 12½ per cent. of hæmatine, so that in the circulation of a person whose body contains thirty pounds of blood, which is a very common average, the normal quantity of metallic iron is very nearly a quarter of a pound! It is therefore easily seen how important an element iron is in the human system, and experience shows that when, from any cause, the slightest diminution takes place in the supply or assimilation of iron from the food, the distressing condition called by physicians *anæmia* is produced, marked, among other symptoms, by a pallid complexion and colorless lips, due to a deficiency of the red globules of the blood, and health can only be restored by administration of hæmatinic medicines, that is, of preparations of iron. All the substances which are used by mankind for food contain iron, and it is one of the most widely distributed of all the elements.

Preparations of *copper* are not of much use in medicine, and it is doubtful yet whether it ever enters into the constitution of animals except accidentally, although it is stated to have been found in minute quantities in the ashes of many plants.

Preparations of *lead* are very seldom administered internally, and as an external application, the acetate, or "sugar of lead," is the only one of frequent use. When lead is introduced into the system in minute quantities, faster than it can be eliminated in the excretions, it combines with the tissues, and accumulates in the system, being what is called a *cumulative poison*. Mercury and silver, and, as some think, foxglove and strychnine, are also cumulative poisons. When lead has accumulated in the system, it produces emaciation, paralysis, and other distressing symptoms. The Belgian chemist, Melsens, has recently pointed out a chemical method of removing these metallic poisons when they have accumulated in the system, which promises to be of very high value. He has experimented upon persons afflicted in this way with iodide of potassium, and has found, as might have been predicted with probability, from the chemical properties of this substance, that when administered in minute successive doses, it carries off, or washes out, the poison from the system, principally through the kidneys, lead or mercury being easily detected in the urine while under the influence of the iodide.

Of the preparations of *zinc*, the sulphate is the most important one in medicine. It is a powerful emetic, and on account of its quick and certain action in this way, it is the emetic generally administered in cases of poisoning. The dose as an emetic is from ten to twenty grains. The valuable medicine known under the name of "tartar emetic," is a substance which crystallizes in beautiful octohedrons, and hemihedral forms or tetrahedrons of the dimetric system, which are sometimes transparent and sometimes opaque. As used for medicinal purposes, it is generally in the form of a white powder. It has a feeble and metallic taste, and, when introduced into the stomach, produces a more powerful nausea than any other emetic. In small repeated doses it produces, among other symptoms, profuse perspiration.

Sulphate of Cadmium resembles very closely, in all its chemical characters, the sulphate of zinc, and it is exceedingly remarkable that it also resembles it in its action upon the human stomach. It is an exceedingly powerful emetic, and it is stated to be ten times as effective in this respect as sulphate of zinc.

Santonine is a beautiful, colorless, tasteless, crystalline substance, obtained from the commercial substance called "wormseed," which is composed principally of the flower buds of some doubtful species of *Artemisia*. When exposed to the light, it becomes of a beautiful golden yellow color without change of composition, the cause of which has not yet been explained. It appears to have chemical qualities more resembling those of acids than alkalies, forming compounds with bases. The singular change of color of santonine takes place under any circumstances, in air, and in a vacuum, under water, or under alcohol. Both the yellow and white kinds dissolve freely in warm alcohol, the latter with a yellow color, but the solution soon becomes colorless, and on cooling the santonine crystallizes out with a white color. But this white santonine, nevertheless, differs in some of its properties from the white santonine which has not been exposed to light, so that santonine appears to be a trimorphous substance, capable of assuming three distinct forms, or natures. Although not an alkaloid, santonine is said to resemble quinine in its medical properties, having been used with success in intermittents. It is also used as a vermifuge, being the active principle of the wormseed. In Germany it has been recently introduced largely into medical practice, being a medicine very easily administered, especially to children, on account of its tastelessness. It is stated that a case of poisoning of two children from an overdose of it has recently occurred, and, if so, its tastelessness might make it a dangerous instrument in the hands of evil disposed persons in the present imperfect state of our chemical knowledge of its reactions, and the consequent great liability of its non-detection by the analyst.

Picrotoxine and *menispermine*, shown by these exhibitors, are two substances which are extracted from the substance called in commerce "cocculus indicus," which is the fruit, according to Lindley, of the plant *Anamirta paniculata*. Cocculus indicus is best known from its being sometimes used to intoxicate fishes by throwing it into the water, thus causing them to rise to the surface and allow themselves to be caught. The picrotoxine is the ingredient which has this effect. Its name refers not only to its intoxicating property, but to its bitterness, in which quality it surpasses most known substances, and it is on account of both these properties that the cocculus has been, and probably still is, used in the adulteration of beer. Picrotoxine kills dogs, but no case is known of death of a human being from its action, although in large doses it would undoubtedly be fatal. It forms transparent white crystals, contains no nitrogen, and appears to be rather acid than alkaline in its characters. Menispermine, which is found exclusively in the pericarp of the seed, while picrotoxine exists only in the kernel, is one of the nitrogenized alkaloids, although tasteless and inert when introduced into the animal economy. The preparation here exhibited is of very great beauty, being in the form of a crystalline mass of the most brilliant pearly whiteness.

Caffeine and *theine* are two crystalline substances which exist, the one in coffee and the other in tea. Caffeine was first discovered by Runge, in 1820, theine subsequently by Oudry. Mulder discovered that caffeine and theine were one and the same thing. Caffeine has since been found in two other plants. Paraguay tea (*Ilex Paraguayensis*) and *guarana* (*Paullinia sorbilis*), the seeds of which are used as an article of diet by the natives of Brazil. Caffeine derived from either of these sources, is a substance which crystallizes in long, white, flexible fibres, like asbestus, but of a more silky lustre. It has a bitter taste, resembling that of quinine, but not so strong. When taken in a pure state in doses of from two to ten grains, according to Lehmann, it produces violent excitement of the vascular and nervous systems, palpitations of the heart, extraordinary frequency, irregularity, and even intermission, of pulse, oppression of the chest, pains in the head, confusion of ideas, ringing in the ears, scintillations before the eyes, sleeplessness, erections, and delirium, and, in all cases, an increased quantity of urea formed. Although the quantity of caffeine in coffee and tea is very small, certainly not more than one per cent. in any case, yet to it the sleeplessness and other effects produced by both, must be attributed, although perhaps essentially modified by other substances existing in them, or produced by the roasting, which both undergo before being used. Caffeine volatilizes unchanged at a temperature above 720° Fahrenheit, so that if the temperature is raised too high in roasting coffee, a little of the caffeine is lost, but this loss is generally trifling. Caffeine is one of the most highly nitrogenized of all known vegetable substances, containing 28 per cent. of nitrogen, and from this fact, and that of its being found in so many of the most highly prized aliments of mankind, together with the existence in chocolate of a very similar substance, called theobromine, which contains even more nitrogen still (42 per cent.), many chemists and others have thought that these substances must play some important part in the human system; which causes such a craving for them ever after in those who have once tasted them, but no satisfactory elucidation of this matter has yet been given.

Gallic and *tannic acids* are two substances which bear a curious relation to one another, and both of which, but especially the latter, have a high importance in the arts of life. Tannic acid is the astringent principle of gall nuts, oak bark, and a great number of other vegetable products. Gallic acid also exists in gall nuts in small quantity, but is usually prepared by the fermentation of tannic acid. It has recently been discovered by Strecker that tannic acid is what is called by chemists a *copulate* of gallic acid and sugar, that is, it is produced by the combination of gallic acid and sugar, with the elimination of a certain quantity of water. This discovery of Strecker is entirely confirmed by the phenomena observed during the fermentation of an aqueous solution of tannic acid. During this fermentation, not only is gallic acid reproduced, but the products of the fermentation of sugar have been found, namely, carbonic acid and alcohol. Strecker also found that when tannic acid was boiled with diluted sulphuric acid, gallic acid and sugar were produced. This is one of those beautiful discoveries now being frequently made by chemists, which indicate that organic chemistry, which a few years ago appeared to be a chaotic mass of isolated compounds, having little or no mutual relations or dependence, will soon be reduced to a beautiful systematic arrangement, and will undoubtedly enable us to comprehend, and possibly to imitate, the complex metamorphoses which take place in the organs of plants. The most important use of tannic acid in the arts is in the form of bark in the tanning of leather, from which it derives its name. It has the property of combining with the gelatine which exists in large quantity in hides, forming a compound which is wholly insoluble and unchangeable by water, whereas uncombined gelatine, in contact with water, absorbs the latter, swelling up and becoming soft. Tannic acid is also used in medicine as an astringent. The most important uses of gallic acid are in photography, and in the manufacture of the numerous hair dyes which are so much in vogue at present.

Chloroform, the anæsthetic agent which is now so commonly preferred to ether, the older and safer one discovered by Dr. Jackson, was first prepared in 1831 by two chemists named Guthrie and Soubeiran, the one in America and the other in France, by precisely the same method, without any knowledge of each other's proceedings. Dumas, who first discovered its true composition, gave it its present name. The cause of most of the deaths which have resulted from the use of this agent has been its power, when too suddenly introduced into the circulation in large quantities, of paralyzing the action of the heart; so that the greatest care should be taken in administering it to have the vapor very largely diluted with air, and it should never be given at all when there is a suspicion of any circumstance which might render the heart more susceptible to its action, such as any disease of that organ, etc. In many cases of apparent death from its action, the beating of the heart has been restored, and the patient saved, by the immediate use of artificial respiration.

Sulphuric acid, or "oil of vitriol," as it was called of old, from the circumstance of its having been first found as a constituent of the class of substances then called "vitriols," now known by name of sulphates, is a compound of sulphur, oxygen, and water, which is made by burning sulphur, and conducting the sulphurous acid gas thus produced into a large leaden vessel, where it is exposed to the combined action of a powerful oxydizing agent, water, and steam, by which it is converted into sulphuric acid. When pure, sulphuric acid is an oily liquid, transparent and colorless, nearly twice as heavy as water, powerfully acid and corrosive to animal tissues. Sulphuric acid may almost be said to be the chemist's *factotum*, to so great a multitude of uses in the arts is it applied. Its cheapness, its powerful affinities, the concentrated form in which it may be obtained, and other peculiarities, render it by far the most valuable reagent in manufacturing operations which we possess. It is not only used almost universally whenever it is necessary to displace another acid from its combinations, but also as a subsidiary to a great number of miscellaneous operations. The greater part of the sulphuric acid made in Europe is used for the manufacture of *soda* from common salt, by the celebrated process invented by the

French chemist, Le Blanc, and called after him, "Le Blanc's process." Previous to the invention of this process, soda was obtained in small quantities in a very impure state from the ashes of seaweeds on the coast of Spain; but during the wars of the French Revolution and of the Empire, this source was of course not available in France, and the inconvenience resulting was so great, that very numerous efforts were made to supply the deficiency. Many processes were proposed and tried for the extraction of soda from common salt, but that proposed by Le Blanc was preferred. It was immediately adopted and put into practice on a large scale; and soon introduced into England, and on account of the low price of salt, has there reached so great a development that more than 100,000 tons of soda ash are now said to be made yearly in Great Britain, and the quantity is rapidly increasing. The cheapness and beauty of the glass made at the present day is wholly owing to the process of Le Blanc. The manufacture of soap, as well as a multitude of other arts in which soda is used, have also kept pace with the increased production of soda ash. The following may be given as a list of some of the more important substances, in addition to soda, in the manufacture of which sulphuric acid is *indispensable:* muriatic and nitric acids, upon which the arts of refining gold and silver, the jeweller's art to a considerable extent, the great modern art of electroplating, and numerous other branches of industry depend; the so-called "soda water" of the shops; acetic, tartaric, citric, oxalic, and fluohydric acids; the alkaloids, a class of substances of the highest importance to the science of medicine; alum; ammonia, and sal-ammoniac; blue vitriol; iodine and bromine, upon which the existence of the daguerreotype art is entirely dependent; bleaching powder, or chloride of lime, the application of which in bleaching is necessary to the existence of the enormous cotton factories of Great Britain and this country; borax; corrosive sublimate and calomel, bichromate of potash, and consequently the pigments chrome-yellow, chrome-green, and chrome-red; Epsom salt; ether; chloroform; phosphorus, and consequently friction matches; platinum.

Our modern art of telegraphing by means of currents of voltaic electricity, which promises to be so prolific in great and good results, can hardly be supposed to have ever been reduced to a sufficiently practical form, without the use of sulphuric acid, or one of the acids dependent upon it. The manufacture of stearic acid candles also, which promises to be of such extensive application, is dependent upon this chemical Briareus; and, in short, it would be difficult to mention a single branch of human industry, which, for its present state of perfection, is not more or less indebted to the use of sulphuric acid.]

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2. Rosengarten and Denis, *Philadelphia, Pennsylvania*—Manufacturers.

Strychnine; sulphates of strychnine, morphine and quinine; nitrate of silver; veratrine and piperine.

[Strychnine, the crystalline alkaloid to which the medicinal properties of the *nux vomica* and some other plants, are partially due, and which is, in a pure state, one of the most powerful poisons known, producing in minute doses, immediate *tetanus*, soon followed by death, is now becoming a quite important article of commerce, being used in various parts of this country for the destruction of vermin, and beasts of prey, wolves, foxes, crows, &c., with great success.

Morphine and quinine are crystalline medicinal alkaloids contained in opium and Peruvian bark. Morphine, discovered by Sertnerner, in 1804, is the most reliable, certain and manageable narcotic known, being far preferable to opium, inasmuch as the strength of the latter is exceedingly variable, and that of the former always the same. The Peruvian barks are derived from different species of Cinchona, which grow in the mountainous regions of Peru, Bolivia, Ecuador and New Grenada, in South America; but the best variety, the *Cinchona regia* or *Calisaya bark*, is found only in Bolivia, and of late years, owing to various causes, among which are the interference of the Bolivian government, a duty of 15 per cent. imposed by our government, and the wars between Peru and Bolivia, its price has risen to so great a height that there is danger of quinine, a remedy more indispensable than any other in many parts of this country, becoming entirely inaccessible to the poorer classes, that is, to those who need it most. Quinine is generally used in the form of sulphate, being itself so little soluble in water that it is only very slowly absorbed when introduced into the stomach. The sulphate, however, and indeed, its compounds with nearly all acids, are very much more soluble.

Nitrate of silver is made in very large quantities by dissolving silver coin in nitric acid, separating the copper by chemical means, for which there are several processes in use, and crystallization. *Lunar caustic*, used by physicians, is fused nitrate of silver, generally, however, adulterated with saltpetre. The commercial form of nitrate of silver at the present day is hard, heavy, transparent, colorless, sonorous, flat crystals, sometimes an inch or more in diameter. Its greatest consumption is in the art of electroplating, but a great quantity must be consumed in the manufacture of the numerous hair-dyes which have come into such extensive use during the last few years, all of which probably contain nitrate of silver. The modern art of photography on paper, glass, &c., or *Talbotype*, must soon require a very large supply of nitrate of silver.

Veratrine is an alkaloid contained in the *rhizoma* or underground stem of the *Veratrum album* or white hellebore, and is probably contained also in the Veratrum viride or American hellebore. It is also contained in the Veratrum Sabadilla, in which, in fact, it was first discovered by Pelletier and Caventon, and simultaneously also by Meissner, and from which it is usually extracted. When pure it is a white powder, perfectly inodorous, but producing when introduced into the nostrils, exceedingly violent sneezing, which has even resulted in death. Its taste is excessively acrid. Veratrine is used in medicine, principally externally, in various forms of neuralgia.

Piperine is a substance crystallizing in beautiful straw yellow crystals, which was discovered in pepper, by Professor Oersted, of Copenhagen, the great Danish philosopher. It is supposed by some to be the acrid principle of the pepper, but when obtained in its purest state, it is found to be entirely tasteless, and the commercial article owes its acridity to a portion of the acrid volatile oil of pepper which strongly adheres to it. It is used in some parts of the country as a substitute for quinine in intermittent fevers, having some reputation as a remedy in these diseases.]

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3. Riofrey, Horace, & Co., *San Francisco, California*—Manufacturers
(Agents, Davis & Henriques, 99 *Wall-st., New York City.*)

Sulphate of quinine, chemically pure, and free from cinchonine, made from the best Calisaya bark, according to the U. S. formula, which is the same as that of the French *codex*. In view of the considerable consumption of quinine in California, its manufacture there seems to be an important matter, as rendering the country independent of uncertain supplies from abroad of a remedy so precious and indispensable.

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4. Husband, Thomas J., *Philadelphia, Pennsylvania*—Manufacturer.

Ponderous calcined magnesia, chemically pure, free from unpleasant taste or smell, and from roughness to the touch or palate. It mixes readily with water, and has three times the density of ordinary calcined magnesia. The manufacture was commenced in 1844.

[Magnesia in a chemically pure state and especially entirely free from *lime*, is a supreme desideratum for medicinal purposes. A trace of lime, which can with difficulty be detected by any ordinary chemical means, will still communicate to magnesia a caustic and exceedingly unpleasant taste; and chemical purity is also requisite to its administration in doses of known strength. It is also equally desirable to have this valuable remedy in a dense ponderous condition, so that it will mingle readily with water, which the ordinary light calcined magnesia will not do, and also in order that a smaller bulk of the substance may produce the desired effect. These two qualities of ponderosity and chemical purity are combined in the highest degree by an article which has been known for years in all the markets of the world, under the name of "Henry's Magnesia," and it is of course an important object with all manufacturers to emulate its excellence. Purity can only be ensured by using materials entirely free from lime, or by adopting some troublesome and expensive process to separate the lime; but the property of ponderosity is more easily attained. It is best accomplished by mixing together solutions of sulphate of magnesia and carbonate of soda, or by adding crystallized sulphate of magnesia to a strong solution of carbonate of soda, in proportions chemically equivalent to each other, evaporating the mixture to dryness, igniting the residual mass, and washing out the sulphate of soda with water, upon which the magnesia is left behind in a dense form, being, when dried and reignited, to expel some carbonic acid which still remains combined with it, about three times as heavy as common commercial magnesia. The cause of this great density has not yet been satisfactorily investigated. If, in this process, sulphate of magnesia which is free from lime, and carbonate of soda which is free from silica and phosphate of soda, are used, the magnesia obtained will also be pure, as well as dense, that is, provided that the water used for washing is entirely free from lime, for carbonate of magnesia has the property of precipitating carbonate of lime from all lime solutions; which carbonate of lime would be converted into caustic lime by the final ignition, and so ruin the product. If the sulphate of magnesia which is to be used, contains sulphate of lime, it can only be purified by dissolving it in diluted alcohol, which cannot dissolve sulphate of lime.]

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5. Fearing & Aikin, *South Yarmouth, Massachusetts*—Manufacturers.

Carbonate of magnesia, calcined magnesia and ponderous magnesia, obtained from the bittern of salt-works where salt is made from sea-water.

[Magnesia is one of the most abundant of the small number of metallic oxides which form the main part of the exterior crust of the earth. It is, therefore, contained largely in all soils and is indispensable to the nutrition of all plants, forming, in many, a greater proportion of the inorganic constituents than even lime, although an excess of it, in certain forms of combination, is found to be injurious to vegetable growth. In the animal kingdom, however, lime is a larger ingredient than magnesia, an excess of the latter being undoubtedly injurious to animal life, when continually and habitually introduced into the system; but, nevertheless, the powerfully cathartic properties of magnesia and its compounds when taken in a concentrated form, and their comparatively harmless action upon the system generally, place them among the most valuable medicinal substances known to mankind.]

6.—Shepard, Samuel C., *Philadelphia, Pennsylvania*—Manufacturer.

SOLUBLE CITRATE OF MAGNESIA.

[All the compounds of magnesia with acids, except the citrate, have bitter tastes, whence the German name for magnesia "Bittererde," *bitter earth*, and are generally exceedingly disagreeable remedies to take. The citrate of magnesia, however, is free from all unpleasant taste, although nearly as powerful a cathartic as the sulphate, or Epsom salt. It is therefore now coming into use more and more. There is, however, a great inconvenience attached to the use of it; this is, that it can be kept in the form of a solution but a very short time, because it decomposes, and undergoes a sort of change, becoming sometimes thick and ropy, and unpleasant to drink. The above preparation is intended to obviate this, being of such a nature that it may be kept for an indefinite time in a solid form, and only dissolved in water just previous to use, when an effervescing solution of citrate of magnesia is immediately formed.]

7.—Pfizer, Charles & Co. 138½ *Water Street, New York City*—Manufacturers.

CHEMICAL PREPARATIONS.

Creosote, red precipitate, calomel and corrosive sublimate; naphthaline and benzole; refined camphor in large cakes, in a glass case.

[*Creosote* is the substance which gives the greater part of the odor, as well as the irritating and antiseptic properties, to the smoke of wood. Its antiseptic properties suggested to its discoverer Reichenbach, its name, which is compounded of two Greek words meaning *flesh-preserver*. It is always a product of the distillation of vegetable, and of most animal substances. Thus, remarkably enough, a product of the artificial destruction of organized matter is the most powerful known agent in arresting their natural decay. There is an important fact which has for many years been known to chemists, which should be generally known by the whole community, but of which, even those who sell creosote are generally ignorant. This is, that what is sold under the name of creosote at the present day, is generally not creosote at all, and sometimes, although having the most perfect similarity to creosote in smell, taste, etc., may actually be entirely destitute of all mixture of the latter. This curious state of affairs is due to the fact that coal tar, which is a much cheaper material than wood spirit, or crude pyroligneous acid, the materials from which the true creosote is obtained, contains, and in a proportion much larger than that of creosote in the materials named, a substance called by chemists, *phenole* or *spirole*, which so closely resembles creosote in its properties, and even in its composition, that the two are frequently confounded even by chemists. This spirole even has, although in a very much less degree, the antiseptic and medicinal qualities of the true creosote. The use of this false creosote to so great an extent is of course the cause of the complaints so often made by prescribing physicians, and dentists, of late years, that creosote no longer has the power to arrest vomiting, and toothache, for which it was once so highly esteemed. It may also occasion, and probably has already occasioned, serious accidents; for the true creosote is very much more corrosive and poisonous than the false, and a person who had been accustomed to take with impunity a certain dose of the latter, might be poisoned if accidentally furnished with the former. This state of affairs cannot be too widely made known, and it is in the highest degree important that some simple test should be devised which could be used by the apothecary, and even by any ordinary individual, for distinguishing the false from the true creosote. This, although the chemical characteristics of the two compounds are nearly alike, can undoubtedly be accomplished, and chemists should turn their attention to the subject.

Red precipitate, calomel and corrosive sublimate are compounds of mercury, the first being the protoxide, the second the sub-chloride, and the last the protochloride of that metal. The discovery of the metal mercury is not recorded in history; it is supposed to have been known to the ancients. Its introduction into medicince, as an internal remedy, we owe to random experiments of the illustrious quack, Paracelsus. The effects of its compounds upon the human system, when administered internally in small doses, are to stimulate the whole of the secreting and excreting organs, the secretions of bile, saliva, mucus, urine and perspiration being increased. The secretion of saliva is especially stimulated, and repeated doses give rise to the condition of *ptyalism*, or *salivation*. In fatally large doses, the soluble salts of mercury are corrosive poisons, and produce *gastro-enteritis*, or inflammation of the gastro-intestinal membrane, accompanied previous to death by *coma* or insensibility, or other affections of the nervous system. With regard to the sub-chloride or calomel, the most strangely conflicting statements have been made as to its action, some calling it an irritant poison, some a sedative, and so on. The truth is, that sufficient attention does not seem to have been paid to the not uncommon occurrence in commercial calomel of *corrosive sublimate*, due to carelessness or imperfection in the manufacture of it. The smallest contamination of this deadly poison should be always guarded against with the greatest care, by chemical examination of the article before purchasing.

Naphthaline and *benzole* are two remarkable substances obtained from coal tar, the semi-fluid substance obtained in such large quantities in the manufacture of gas. As chemical compounds they are remarkable for the very large quantity of carbon which they contain, naphthaline being in fact the most highly carbonized substance known to chemists, containing 93·75 per cent. of this element. It is obtained by sublimation, crystallized in the form of beautiful pearly thin scales, which are so light and take up so much room that a bottle of the capacity of half a gallon will hold only a few ounces of them. It has a peculiar sweet smell, and an aromatic taste. No use has yet been made of it except to a small extent in medicine, it having been found by Dupasquier, and since by others, to be an expectorant agent of remarkable power, being also however, stimulant and therefore inapplicable to all cases where expectorants are required. Benzole at present promises to be of more value in the arts than naphthaline. It is a transparent, colorless, volatile liquid, which contains 92·3 per cent. of carbon, boils at 175° Fahr., and has a pleasant odor recalling to some that of chloroform, like which it is anaesthetic. It freezes at the same temperature as water, and at zero is a transparent solid substance as hard as crystallized sugar. When benzole is set on fire it burns with a very smoky flame, owing to the large quantity of carbon that it contains, but when a current of air is passed through or over the surface of benzole, it becomes impregnated with its vapor, and then burns with a flame probably more brilliant and whiter than any other known, so that if benzole should ever be made cheaply enough, of which there is no impossibility, it may be a very valuable source of illumination. This liquid has also very remarkable solvent powers, being able to dissolve among other substances, caoutchouc and gutta percha, leaving on evaporation these substances with their properties unchanged.

Camphor is a solid essential oil obtained from the tree *Laurus camphora*, which grows in China, Japan, Cochin-China and Java. It occurs in every part of the tree, and even in the root, the whole wood having a strong smell and taste of camphor. Crude oil of lavender contains camphor in solution according to Dumas, and it is stated that it also exists in the oils of rosemary, peppermint, pennyroyal and origanum. It is formed, according to Rochleder, by the action of nitric acid upon oil of sage, and according to Doepping, by the prolonged action of the same oxidizing agent upon amber. Every person is familiar with its appearance and general properties. It can be made to crystallize in transparent colorless octohedrons. It is very volatile even at the ordinary temperature, and should be kept in tight bottles or a considerable loss will be sustained. Small fragments of camphor thrown upon water float upon the surface and assume a swift rotary motion. This curious phenomenon is due to the combined influence of the evaporation of the camphor at the ordinary temperature, and of a strong molecular repulsion which exists between it and water, and is precisely similar to the phenomena presented by water when in the condition called the *spheroidal state* of Boutigny.—H. W.]

8.—Tilden & Co., 98 *John Street, New York*—Manufacturers

MEDICINAL EXTRACTS PREPARED *in vacuo*.

Ext. Aconiti,
" *Apocyni Androsæ.*, (Bitter Root,)
" " *Canab.*, (Indian Hemp,)
" *Asari Canaden.*, (Canada Snake Root,)
" *Anthemidis*, (Chamomile,)
" " *Cotulæ*, (Wild Chamomile,)
" *Amygdali Pers.*, (Peach,)
" *Artemisiæ*, (Wormwood,)
" *Asclepias Inc.*, (White Indian Hemp,)
" *Belladonnæ*,
" *Cornus Floridæ*, (Boxwood, Dogwood,)
" *Conii*,
" *Chimaphilæ*, (Princess Pine, Pipsissewa,)
" *Cimicifugæ*, (Black Cohosh,)
" *Colombæ*,
" *Chelidonii*, (Celandine,)
" *Cypripedii*, (Ladies' Slipper,)
" *Cannabis Ind.*, (Indian Hemp, Foreign,)
" *Colocynthidis*, (Colocynth,)
" " *Compositum*,
" *Digitalis*,
" *Dulcamaræ*, (Bittersweet,)
" *Eupatorii*, (Boneset,)
" *Filicis Maris*, (Malefern,)
" *Gentianæ*,
" *Geranii Mac.*, (Cranesbill,)
" *Glycyrrhizæ*, (Liquorice,)
" *Hyoscyami*,
" *Hellebori*, (Black Hellebore,)
" *Heraclei*, (Master-wort,)
" *Jalapæ*,
" *Juglandis*, (Butternut,)
" *Iridis Versicol.*, (Blueflag,)
" *Lobeliæ Inflatæ*,
" *Lycopi Virg.*, (Bugle,)
" *Humuli*, (Hop,)
Ext. Lactucæ, (Lettuce,)
" *Leontice Thalictroides*, (Blue Cohosh,)
" *Lappæ*, (Burdock,)
" *Menispermi Canaden.*, (Parilla,)
" *Marrubii*, (Horehound,)
" *Myricæ Ceriferæ*, (Bayberry Bark,)
" *Phytollaccæ*, (Poke Root,)
" *Podophylli*, (Mandrake, May Apple,)
" *Papaveris*, (Poppy,)
" *Quercus Albæ*, (White Oak,)
" " *Tinctoriæ*, (Black Oak,)
" *Quassiæ*,
" *Rhei*,
" *Rumicis Crispæ*, (Yellow Dock,)
" *Rutæ*, (Rue,)
" *Rubi Villosi*, (Blackberry,)
" *Sarsaparillæ. Amer.*,
" " " *Comp'd*,
" " *Rio Negro*,
" " " *Comp'd*,
" *Sabinæ*, (Savine,)
" *Sanguinariæ*, (Blood Root,)
" *Solani Lycopersici*, (Tomato,)
" *Stramonii*,
" *Spirææ*, (Hardhack,)
" *Saponariæ*, (Soapwort,)
" *Sennæ Alex.*,
" *Spigeliæ*,
" *Taraxaci*, (Dandelion,)
" " *Radicis*, "
" *Trifolii*, (Red Clover,)
" *Uvæ Ursi*,
" *Veratri Albi*, (White Hellebore,)
" *Verbasci*, (Mullein,)
" *Valerianæ*, (English Valerian.)

[Medicinal vegetable extracts are the masses obtained by evaporating down, to a consistence convenient for use in medicine, either the expressed juice of a fresh plant, or the solution obtained by the exposure of either a fresh or a dried plant to the action of a solvent. The object is to obtain the medicinal principle of the plant in as concentrated a form as possible, and divested, as much as possible, of the inert matter which accompanies it; and the accomplishment of this requires not only that the solvent used should be of the kind ascertained by previous experience to be best adapted, but that the solution and evaporation should be so conducted as not to admit of loss or chemical alteration of any of the active principles, which are sometimes exceedingly alterable by exposure to a high heat, or even to a low heat in the presence of atmospheric oxygen; the frequent inertness of many preparations of this kind being generally due to such alteration of composition having taken place, from want of proper precautions in the manufacture. The preparations of these exhibitors are evaporated *in vacuo*, a precaution which to a great degree avoids such sources of deterioration to the product. The apparatus is similar to that used by sugar refiners in evaporating their syrups, and consists of several large spheroidal vessels, heated by steam, into which the vegetable infusions are introduced, the vapor formed being continually pumped out by a large air-pump, worked by steam. The evaporation may be conducted in this manner quite rapidly at a temperature of from 100° to 110° Fahr., without contact with the atmosphere. These exhibitors claim the credit of the first introduction of this mode of manufacture into this country on an extensive scale. Their apparatus was first brought into successful operation in 1849, and during the past season were made by them 30,000 pounds of extracts, consuming nearly 1,000,000 pounds of material. The greater number of the extracts exhibited are made from indigenous American plants, and being therefore of especial interest, will be particularly alluded to, together with a few others, which present points of interest, and have not been elsewhere noticed.

Apocynum androsæmifolium, "dog's-bane," or "bitter root," is an herbaceous plant which grows along fences and the skirts of woods, in all parts of the United States. The root is the active part, and like the rest of the plant, contains a milky juice. When recently dried, it has emetic properties, but loses its activity by keeping.

Apocynum cannabinum, called "Indian hemp" in this country, a name which, unfortunately, has of late been applied in Europe to a totally distinct plant, the East Indian variety of *Cannabis sativa* (see below), resembles very closely in appearance the "dog's-bane," also contains a milky juice, and has a tough fibrous bark, which upon proper preparation, yields a substance resembling hemp. The root is the active portion, and is powerfully emetic and cathartic, also diaphoretic and expectorant, and sometimes diuretic. From 15 to 30 grains only of the powdered root, are necessary to produce these effects.

Asarum Canadense or "Canada snake root," sometimes called "wild ginger," is a

plant which grows in woods and shady places in all parts of the United States. It closely resembles in appearance the *Asarum Europæum*, or "asarabacca," but differs entirely in its medicinal effects, for while asarabacca is very acrid, emetic and cathartic, the *root* of our plant, which is the officinal part, is an aromatic stimulant, with diaphoretic properties, very much resembling in its effects the Virginia snake root (*Aristolochia serpentaria*), another American plant. Its taste somewhat resembles that of ginger, for which it is sometimes substituted in the country.

Anthemis nobilis, or "chamomile," is a European plant. The flowers only are used, and their virtues reside in the volatile oil, which gives them their peculiar odor. This volatile oil is a very singular substance, of a *dark blue color*. Gerhardt obtained valeric acid by the action of potash upon it. It has not yet been sufficiently investigated.

Anthemis cotula, "wild chamomile," or "May-weed," as it is usually called, is also supposed to be a native of Europe, although it is a common weed in this country. It has a disagreeable smell, differing from that of chamomile, but its medical effects are essentially the same, stimulant and antispasmodic.

Asclepias incarnata, is one of the native species of *Asclepias* which grow so abundantly in all parts of the United States, and which are called by the country people "milkweed," from the milky juice which exudes from them when wounded. This species has sweet-scented red flowers arranged in umbels. Its medical properties are not much known, although it is said to be a useful emetic and cathartic.

Cornus florida, or "dogwood," is a native of the United States, growing generally on hill sides, in all parts of the country. It is a tall shrub, or rather a small tree, which grows usually to the height of 15 or 20 feet, but sometimes to 30 or 35 feet, and with a diameter of 3 or 4 inches. It flowers in May, and forms a very beautiful object, being covered with a profusion of brilliant white blossoms. Its bark is the active part, and has tonic and astringent properties. In many parts of the country it has considerable reputation as a remedy for intermittents and other diseases in which quinine is now used. No satisfactory chemical examination has been made, but it is supposed to contain a peculiar crystalline principle, to which the name of *cornine* has been applied.

Cimicifuga racemosa, "black snake-root" or "black cohosh," is a tall native herb, 6 or 8 feet high, with large leaves, which grows every where in the woods of the United States. The root, which is the active part, is contorted (whence its name), has a peculiar disagreeable odor, and bitter, astringent, somewhat acrid taste. The accounts given of its medicinal virtues by different authorities, are so various, that in the present state of our knowledge, no very definite opinion can be drawn, but it would seem from all the accounts to be a powerful medicinal agent.

Colomba root is the root of *Cocculus palmatus*, a Mozambique plant, and is one of the most useful of our tonic and stomachic medicines. Its virtues are due to a crystalline bitter principle, called *colombine*, which crystallizes in fine, transparent, colorless, rhombic prisms, is fusible like wax, possesses an excessively bitter taste, free from astringency, contains no nitrogen, and is neutral.

Chelidonium majus, or "celandine," is a native of Europe, but grows wild in this country. It is an herb, one or two feet high, which bears small yellow flowers, arranged in umbels, and is filled with a milky yellow juice. Probst, of Heidelberg, found in this juice no less than four distinct crystalline principles, only one of which, however, is of particular interest, being the active principle of the plant. This substance was called by him *Chelerythrine*, and appears to be identical with the alkaloid found in *Sanguinaria canadensis* by Dr. Dana of New York (see below). It is also found in *Glaucium luteum*. From its alcoholic solution, it crystallizes in wart-like masses. It possesses a sharp burning acrid taste, is itself *colorless*, but forms neutral salts with acids, which all possess beautiful *red colors*. In its medicinal effects, it is similar to sanguinarine, acrid and narcotic.

Cypripedium parviflorum, or "ladies' slipper," is a plant bearing beautiful flowers, which grows wild in the woods in the United States. Its medical effects are similar to those of valerian, stimulant with a tendency to the nervous system, and by some it is considered equal in power to valerian.

Cannabis Indica, called "Indian hemp" in Europe, is an Asiatic variety of the *Cannabis sativa*, or common hemp, which appears to possess extraordinary powers over the human organization, entirely dissimilar from those of any other plant. The intoxicating drugs know in Eastern countries under the names of *hatchis* or *hashish*, *gunjah*, *churrus*, and the *bhang*, so often mentioned in the "Arabian Nights Entertainments," are all preparations of Cannabis. The active principle is a resinous substance with which the leaves are impregnated, called *cannabine*. Pereira describes its medicinal effects as exhilarant, inebriant, phantasmatic, hypnotic or soporific, and stupefacient or narcotic. The effects upon the Orientals appear to be more powerful than upon Europeans generally, and not precisely similar in kind, owing probably to different degrees of excitability of the nervous system; and several cases are related by high authority, as occurring in India, in which large doses produced "that strange and most extraordinary of all nervous conditions, that state which so few have seen, and the existence of which so many still discredit,—the genuine *catalepsy* of the nosologist." When an arm or leg was bent, it remained in the position in which it had been placed. The body remained in any posture in which it might be placed, no matter how contrary to the influence of gravity upon its various parts. After recovering from this condition, the patients generally expressed themselves excessively hungry.

Solanum dulcamara, or "bittersweet," is a climbing shrub, which is very common, especially in damp and sheltered places, both in Europe and North America. It deserves notice as containing in its stems an alkaloid identical with that contained in the stalks of the potato plant (*Solanum tuberosum*), which alkaloid is also otherwise curious. *Solanine*, as it is called, crystallizes from alcohol in microscopic prisms. When dry it is inodorous, but when moist it smells like water in which potatoes have been boiled. Its taste is feebly bitter, and it produces in the throat when swallowed in minute quantity, a peculiar unpleasant sensation, which remains for some time. Of all known alkaloids, it possesses the highest equivalent (10,187.5 on the oxygen scale), and of all known compounds contains the smallest percentage of nitrogen (1.72 per cent.). It is found also in other species of Solanum. It is supposed to be the medicinal principle of bittersweet, and of potato tops. Bittersweet is diaphoretic and diuretic, and in large doses said to be acro-narcotic.

Eupatorium perfoliatum, "boneset," or "thorough-wort," is a native American plant, which is tonic, diaphoretic, and in large doses emetic and aperient. It is said to have been successful in intermittents.

Geranium maculatum, "spotted geranium," or "cranesbill," is an herb which grows one or two feet high in moist low grounds in the United States, bearing a large purple flower. Its root, which is the medicinal part, is a powerful astringent, and free from all unpleasant taste and other offensive qualities, which renders it peculiarly fit for administration to delicate patients.

Heracleum lanatum, or "master-wort," is a very large umbelliferous plant, which is indigenous in the northern United States. Its root has a strong, disagreeable odor, an acrid taste, and is somewhat stimulant and carminative.

Juglans cinerea, "butternut." The inner bark of the root of the butternut tree is a mild cathartic, resembling rhubarb in its action.

Iris versicolor, "blue flag," is a native of the United States. Its *rhizoma*, or underground stem, has a nauseous acrid taste, and is cathartic, emetic and diuretic, all of which properties it loses by age.

Lobelia inflata, "Indian tobacco," is a native American plant, which grows as a very common weed all over the United States, by the roadsides and elsewhere. It grows a foot or more in height, and bears a delicate blue flower. The whole plant, but especially in the seeds, contains an alkaloid called *lobeline*, which is its active principle. Lobeline is a light yellow liquid, of a somewhat aromatic odor, has an alkaline reaction, and forms crystalline salts with acids. A quarter of a grain excited vomiting in a cat, and one grain rendered the animal motionless for half an hour, with dilated pupils. The therapeutical action of Lobelia is not yet very satisfactorily ascertained, but it appears to be very similar to that of tobacco, though milder. Many deaths have occurred both in this country and Europe from its use by quacks.

Lycopus Virginicus, or "bugle-weed," is an indigenous herb, which grows in wet and shady places throughout the United States. It is a very mild narcotic.

Marrubium vulgare, "white horehound," is a native of Europe, but grows wild in the United States. It was formerly used by physicians, but is no longer considered of any value.

Myrica cerifera, "bayberry," or "wax myrtle," is an aromatic shrub, which grows from one to twelve feet high all over the United States. The berries are covered with white coats of a peculiar kind of wax, called "myrtle wax," which may be separated, and is sometimes used. The bark of the root is acrid and astringent, in large doses emetic, and is a popular remedy for jaundice.

Podophyllum peltatum, "May apple" or "wild mandrake," is a native American plant, which grows very extensively throughout the United States in moist grounds. The stems are herbaceous, about one foot high, and each bears at the top two large palmate leaves. Each stem bears one handsome white flower. The fruits when ripe, are large oval berries, of a lemon yellow color, full of sweetish pulp, which is eaten by some, and are known to the country people under the name of "May apples." The root is the medicinal part, and is cathartic, acting certainly and powerfully, without griping or other unpleasant sensations. It is highly spoken of by many eminent medical authorities.

Quassia is the wood of *Picraena excelsa*, or the "bitter wood tree," a lofty tree, sometimes one hundred feet high, which grows in Jamaica and the Caribbean Islands. The wood has a pure bitter taste, and contains a crystalline substance called *quassine*, of an insupportably bitter taste, which contains no nitrogen, and is neutral. The therapeutic effect of quassia is that of a simple bitter, devoid of all irritant, stimulant, and astringent properties. It is purely tonic in its action, and is peculiarly adapted for the use of dyspeptics. It is said to be sometimes used in the manufacture of beer, instead of hops, and if so, is undoubtedly an improvement over the latter.

Rubus villosus is the most abundant of the very numerous species of blackberry which are natives of the United States. The root is the medicinal portion, and is tonic and strongly astringent, and its use is spoken of very favorably by high authority, in bowel complaints, such as diarrhœa, &c.

Sanguinaria Canadensis, "bloodroot," is a small herbaceous plant, which grows to the height of a few inches, in shady woods, throughout the whole United States, bearing a beautiful white flower very early in the spring, sometimes while the snow still lies upon the ground. The plant contains a yellow thick milky juice, and the root, which is the medicinal part, is also full, when fresh, of a bright red liquid, which exudes from it copiously when wounded. Dr. Dana, of New York, found in this root an alkaloid, which he called *sanguinarine*, but which has since been stated by Shiel to be identical with *chelerythrine*, the alkaloid found by Probst in celandine (see above). Like the latter, it is itself colorless, and forms salts of a brilliant red color. Its medicinal effects are also very similar to those of celandine, Sanguinaria being an acrid emetic, with stimulant and narcotic powers.

Spiræa tomentosa, "hardhack," is a shrub, which grows native in the United States, especially in the Northern States, to the height of two or three feet, and bears beautiful red or purple flowers. Its root, the part used, is tonic and astringent, and is highly recommended for debilitated patients.

Saponaria officinalis, "soap-wort," vulgarly known by the name of "Bouncing Bet," is an herb, which grows wild in the United States, but has probably been introduced from Europe. It grows to the height of one or two feet, and bears clusters of light purple flowers. The name of the plant is derived from the property, which the root and leaves possess, of

forming a lather, like soap-suds, when agitated with water. This property is due to the presence of a peculiar principle called *saponine*, which was discovered in this plant by Bley, and which has been found in several other plants, such as *Gypsophila struthium*, and different species of *Silene*, *Dianthus*, *Lychnis* and *Anagallis*. Saponine, when pure, is white and uncrystallizable, possesses a sharp, persistent taste, and when inhaled in the form of powder, provokes *sneezing* powerfully. It is soluble in water in all proportions; the solution is turbid, and, on agitation, even when very dilute, foams very greatly. The medicinal properties of Saponaria are also attributed to saponine, and seem to be similar to those of sarsaparilla, to which, as an alterative medicine, it is thought superior by some physicians.

Spigelia Marylandica, "Carolina pinkroot," is a native of the southern and south-western parts of the United States. It is an herbaceous plant, from twelve to twenty inches high, the stems being four-sided, and each stem bearing a spike of flowers, the corollas of which are colored orange yellow internally, and rich carmine externally. Its medicinal properties were first learned from the Cherokee Indians. The root, which is the medicinal part, acts as an irritant to the gastro-intestinal canal, when taken internally sometimes causing purging and vomiting. It is used only as a vermifuge, and although scarcely known in Europe, in this country it is among the most powerful and highly esteemed anthelmintics in use.

Arctostaphylos uva-ursi, "uva-ursi" or "bear-berry," is a low evergreen trailing shrub with a red berry, which is found growing in barren soils, in the northern latitudes of both Europe and America. The leaves, which contain more than 30 per cent. of tannic acid, according to the analyses of Meissner, are the part used in medicine. Their activity depends upon this tannic acid, and their effects are those of other vegetable astringents, but their principal use is in chronic affections of the bladder. Their effect in these diseases, however, is very slowly produced, and they must be used for a long time.

Verbascum thapsus, "mullein," is considered to be a native of Europe, and to have been naturalized in this country, where it is in some parts of the country one of the most common of all our weeds of the field and roadside. The leaves are the parts used in medicine, and their aqueous decoction has emollient, demulcent, and feebly narcotic properties. Mullein seeds are known to have a narcotic effect upon fishes. It has been employed in catarrhs and diarrheas.]

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9. United Society of Shakers, *Enfield, Grafton County, New Hampshire*, Manufacturers. (Agent, Hiram C. Baker, *Enfield.*)

Medicinal extracts of English valerian, dandelion, clover, Hyoscyamus (henbane), night shade (belladonna), thornapple (stramonium), Phytolacca decandra (poke-weed), and Conium maculatum (hemlock). Essential oils of English valerian, wormwood and wormseed.

[The plant called *valerian* (*Valeriana officinalis*) is a native of Europe, but has been cultivated in this country to some extent. The English variety is most esteemed, and hence is called "English valerian." It is a large handsome herb, bearing bunches of small white or rose-colored fragrant flowers, which in Europe grows wild, both in moist and dry localities. The rhizoma or underground stem, is the portion in which the medicinal virtues reside. These virtues are dependent, at least partially, upon the presence or formation of a peculiar substance, called by chemists *valeric acid*. This acid is also a constituent, or product of the transformation, of numerous vegetable and animal substances. It was first discovered by Chevreul in the oils of whales and dolphins, of which it forms a constituent. It is also a product of the root of angelica (*Archangelica officinalis*), of the transformation of a substance found in the root of *Athamanta oreoselinum*, of the bark of the *Sambucus Canadensis* or elder, of the fruit of *Viburnum opulus*, and others. It is also a constituent of an ethereal substance which forms the aroma of apples and some other fruits. It is a product of the putrefaction of caseine, and has been found by several chemists in old cheese. Gerhardt obtained it by the decomposition of oil of chamomile. The method usually adopted for obtaining it in a pure state is by the oxidation of a substance called *fusel oil*, which is the product of the fermentation of some unascertained constituent of vegetable tissues, being found among the distilled products of nearly all fermented alcoholic liquids, and especially in grain and potato spirits. In chemical language fusel oil is an *alcohol*, and valeric acid bears the same relation to it that acetic acid does to common alcohol, that is, it can be formed by oxidating it to a certain extent, just as acetic acid (acid of vinegar) is formed by oxidating common alcohol. Thus when fusel oil, or *amylic alcohol*, as chemists call it, is submitted to the action of sulphuric acid and bichromate of potash, valeric acid is formed, which, however, immediately combines with a portion of the unoxidized fusel oil, and instead of valeric acid, there distils over a sweet smelling liquid which is the valerate of oxide of amyle, and is identical with the volatile oil of *apples*. From this, valeric acid may be obtained by distillation with potash. Pure valeric acid is a transparent colorless liquid of a sour taste and a strong and persistent smell of valerian, which adheres to every thing that touches it for a long time. It is easily set on fire, and burns with a white smoky flame. Valeric acid is contained in the crude essential oil of valerian, a specimen of which is exhibited by these exhibitors, but the greater portion of this essential oil is made up of a substance called by Gerhardt *borneene*, and which is identical with the essential oil of the camphor tree of Borneo and Sumatra, by the oxidation of which the *Borneo camphor* is produced (a sort of camphor which resembles in smell, but not in composition, our ordinary camphor, and which is entirely consumed by the Chinese, being so highly valued by them, that it is said to command in their markets one hundred times the price of common camphor, and for this reason never reaches this country or Europe, except as a curiosity), and also, according to Brandes, with the volatile oil of sweet-bay berries (*Laurus nobilis*). The medicinal effects of valerian root, as well as of its essential oil, and its fluid extract, are similar, and, according to some, entirely dependent upon their content of valeric acid. They act upon the cerebro-spinal system, producing headache, restlessness, giddiness, optical hallucinations, such as scintillations of light, etc. In certain morbid conditions of the nervous system, as epilepsy, hysteria, hypochondriasis, etc., it possesses what is called a *nervine* effect, especially when combined with ammonia, stimulating the nervous system and calming the patient. It is frequently found to fail, and even when successful, to lose its power very soon, and little confidence is placed in it by most physicians. Cats and rats manifest a curious fondness for valerian, and upon the former animal it produces a violent species of intoxication.

Dandelion (*Taraxacum officinale*), which is so common a plant in our fields, contains a milky juice (especially in the root) which possesses stomachic and tonic properties, and it is sometimes used in medicine. Its active principle is probably an imperfectly crystalline bitter substance called *taraxacine*, which has been found in it, but which is little known.

Hyoscyamus niger, or common henbane, is a plant of much greater importance. Every body is familiar with the appearance of this plant, as it grows as a common weed, in all parts of this country, although not a native of America, having been introduced from Europe, where it also grows abundantly every where. Its active alkaloid principle, *hyoscyamine*, was discovered in 1822, by Brandes, but its existence is denied by some. Those who have procured it describe it as crystalline, inodorous when dry, but when moist having an excessively offensive, stupifying, tobacco-like smell. It is a powerful narcotic poison, and a very trifling quantity produces dilatation of the pupil. In every respect, it is very similar to atropine (see note to No. 92, Class 2). It contains nitrogen, but no analysis has been made. The extract of henbane given in small successive doses produces a sedative effect, especially in cases of nervous irritability, and in large doses sometimes induces sleep, without producing the constipation, and other prejudicial effects of opium. On this account, it is frequently used instead of opium, and is in many cases a very valuable remedy. In poisonous doses it produces, among other symptoms, loss of speech and vision, with dilatation of the pupil, furious delirium with phantasms, and paralysis, sometimes followed by death.

Stramonium or thornapple (*Datura stramonium*) is also one of the most common weeds in all parts of the country, and well known for its handsome large white nauseously smelling flowers, and thorny pods full of black seeds. The active principle, an alkaloid called *daturine*, is found in the leaves and seeds. It resembles generally hyoscyamine and atropine in its chemical properties, and it has been asserted to be chemically identical with atropine. Its effects upon the human system also closely resemble those of atropine.

The *poke-weed* (*Phytolacca decandra*) is a native American plant, not being even recognized in European works on materia medica. Every schoolboy is familiar with this plant as it grows along the roadside, with its elegant pendulous racemes of purple berries, full of juice. This juice may yet be useful for dyeing purposes. The berries and root are emetic, purgative and slightly narcotic. Its properties are peculiar, as it does not begin to act until two or three hours after its administration, and then continues to act both as an emetic and purgative, for a long time, with little or no pain or spasm. It possesses other medicinal virtues, which it would take up too much space to detail. No chemical examination of this plant has yet been made.

Hemlock is a name frequently applied in this country to the tree more correctly called *spruce*, or spruce-fir (*Abies canadensis*), while the name hemlock should only be applied to the poisonous umbelliferous herb so called in England. This plant is a native of Europe, but has been naturalized in the United States, and grows as a common weed. The narcotic principle, which is a volatile liquid alkaloid substance, called *conine*, is found in the leaves and seeds. It is a transparent colorless liquid, one drop of which placed in the eye of a rabbit, killed it in nine minutes, and five drops poured into the throat of a dog produced death in one minute. The effects of hemlock upon the human system when given in small doses are uncertain, and generally not very obvious or important. In large doses, it generally produces coma, very similar to that of opium, followed by death.

The *essential oil of wormwood* (*Artemisia absinthium*) is a greenish liquid of an acrid taste and a strong odor of wormwood. It has precisely the same chemical composition as *camphor*, or in chemical language it is *isomeric* with camphor. Whether the medicinal properties of wormwood are due to this oil, is yet unsettled, but the probability is that they are to be ascribed rather to the bitter principle of the plant, called *absinthine*.

The American *wormseed*, or "Jerusalem oak" (*Chenopodium anthelminticum*), which is a very different thing from the European, so called, "wormseed" (see note to *santonine*, No. 1, Class 2), grows as a common weed in the southern portions of the United States. The whole herb has a strong offensive odor, and contains, especially in the seeds, a peculiar essential oil, of very strong vermifuge properties, a specimen of which is here exhibited.]

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10. Williamson, Mann & Co. 94 *Front street, New York City*, Manufacturers.

Powdered drugs and medicinal extracts. Powdered gums; tragacanth, Arabic, kino, myrrh, aloes, gamboge, opium, olibanum, catechu, guaiacum. Powdered roots; rhubarb, colomba, ipecacuanha, jalap, squills, liquorice and snake root. Powdered hops, rose leaves, digitalis (foxglove), senna, buchu leaves, bayberry bark, red ditto, slippery elm, burnt alum, castile soap, sal-ammoniac, borax, cochineal, wormseed, dragon's blood, sugar of milk.

[Apothecaries always possess their own means of pulverizing drugs on a small scale, but the large quantities of some drugs required in a state of the finest possible powder, and the very laborious and tedious manipulations necessary to obtain such powders by hand labor, have led to the establishment, of late years, of *drug mills*, driven by steam power, by which great economy of time, labor and material is effected. This invention, if not quite equal in importance, is at least similar in kind to the substitution of grist mills for grinding grain, for the old hand mills used for the same purpose, or the rude mortars and pestles used by the American Indian woman for the manufacture of "hominy."]

11. Ellis, Charles & Co. 56 *Chesnut Street, Philadelphia,* Manufacturers.

Chemical and pharmaceutical preparations, including ponderous magnesia, blue pills, solid extracts of sarsaparilla, colocynth, gentian, rhubarb, and jalap, citrate of magnesia, precipitated carbonate of iron, confection of senna, solidified copaiva, pure spirit of nitrous ether, iodides of mercury, chloride of zinc, soluble citrate of iron, tannic acid and phosphate of iron.

[*Blue pills* (*Pilulae Hydrargyri*) are made by rubbing together in a mortar metallic mercury with liquorice root in powder, and other substances for the sake of giving consistence to the mass, until all globules of mercury disappear. They therefore contain metallic mercury in a finely divided state. According to the directions of the United States Pharmacopeia, each pill contains one grain of mercury in this condition. They are preferred to calomel and other preparations of mercury on account of being milder and safer, and less likely to produce a cathartic action, although exerting upon the system all the other effects of mercurials.

Sarsaparilla is composed of the *rhizomas* of several species of the genus *Smilax*, and it is remarkable that the very species to which the drug has given its name, the *Smilax sarsaparilla*, which is a native of the United States, does not yield any of it. The sarsaparilla of commerce is brought from various parts of South America and Mexico. It contains a crystalline principle called *smilacine*, which has little or no taste, contains no nitrogen, and is neither acid nor basic. Its effects and that of sarsaparilla itself upon the human system in small doses do not appear to be of much importance. In extremely large doses, it causes nausea and vomiting. Some consider it a sovereign remedy in cases of *syphilis*.

Colocynth, the fruit of *Citrullus colocynthis*, is a drug which is imported from the Levant. The plant, which bears a considerable resemblance to the common watermelon vine, is a native of Turkey, and grows also in Nubia and lower India. The drug, as imported, is in the form of balls, two inches, more or less, in diameter, nearly full of seeds, which are enveloped in a light and spongy dried pulp. This pulp is the only valuable portion, the seeds being inert, and contains a large percentage of a nauseous bitter substance, called colocynthine, to which its virtues are due. Colocynth is used in medicine as a purgative, perfectly safe in small doses, although in excessive quantities, it has on several occasions produced death.

Rhubarb is a drug with whose appearance and medical properties every one is familiar. The best variety is that called Russian, or sometimes Turkey rhubarb, which comes to us by the way of St. Petersburg, but much the largest quantity comes from Canton, and is called Chinese or India rhubarb. It is the root of a yet unascertained species of *Rheum*. Rhubarb contains several distinct proximate principles, some of which are crystallizable, but its medicinal virtues have not yet been found to depend upon any one of them alone.

Jalap is the root of *Exogonium purga*, a plant which grows in Mexico, in the neighborhood of the city of Xalapa, in Vera Cruz, from which its name is derived. That which is kept in the shops is always in powder. Its active ingredients are resinous substances.

Spirit of nitrous ether, called also, in common parlance "sweet spirits of nitre," is in chemical language a mixture of nitrite of oxide of ethyle, or nitrous ether, with alcohol, so that its medicinal effects are those of nitrous ether, modified by those of alcohol. Pure nitrous ether is a pale yellow liquid of a strong smell somewhat resembling that of apples, and of a burning sweet taste. It is very volatile when pure, boiling even below the ordinary temperature (its boiling point, according to Liebig, is 61.5 Fahr.), so that it would be impossible to preserve it unless it were diluted with alcohol. In this diluted form it is very much used in medicine, its effects being diuretic, diaphoretic, and antispasmodic.

The *iodides of mercury* are three in number, only two of which, however, are used in medicine, namely the subiodide and protiodide. The subiodide is a dark green powder, corresponding in composition to calomel, the subchloride of mercury. It is colored black by light, is insoluble in water, and on sublimation is decomposed into metallic mercury and another iodide containing less mercury. It is a powerful irritant poison, in large doses, and it has been used in cases where the two diseases syphilis and scrofula coexist, for the sake of producing the combined effect of mercury and iodine. Protiodide of mercury is an exceedingly curious substance, which, like carbon (see note to Class 1, No. —), is capable of existing in more than one distinct form. The ordinary form is that of a rich scarlet red powder, which, upon being melted, becomes yellow, and upon cooling still retains its yellow color when solidified, above a certain temperature, but upon farther cooling, generally returns to the red condition. Upon sublimation of the red modification, it condenses in prismatic crystals of the yellow modification. These crystals sooner or later spontaneously, and immediately when rubbed, return to the red condition. If the vapor be condensed upon a sheet of paper so as to cover it with a film of minute crystals of the yellow form, this paper may be written or drawn upon with any pointed body, such as a sharpened stick, which will leave brilliant scarlet traces, and these traces may be made to disappear again by warming the paper. There is no other substance which furnishes phenomena precisely parallel to these. Protiodide of mercury is used in medicine for the same purposes as the subiodide, being, however, much more energetic than the latter. It is said to be as powerfully irritant and caustic as corrosive sublimate.

Chloride of Zinc, when free from water, is a white translucent substance, which is soft and plastic, like wax, and is hence sometimes called "butter of zinc." It is an exceedingly *deliquescent* substance, that is, it has a powerful attraction for atmospheric moisture, and a lump of it exposed to moist air, melts down to a liquid solution in a few minutes. It has also the property of coagulating and combining with albuminous substances, and by virtue of these two properties it has the power of decomposing and destroying the vitality of animal tissues, being therefore used by physicians as a caustic. It has also been proposed as a disinfecting agent, a solution of it having the power of decomposing the bad smelling sulphohydrate of sulphide of ammonium, which always accompanies the exhalations of putrifying substances. From its power of combining with the tissues, it is somewhat antiseptic, and has therefore been used as an injection for bodies which are to be used for anatomical purposes. H. W.]

12.—Haskell, Merrick and Bull, 10 *Gold Street, New York City.*—Manufacturers.

Powdered Drugs; aloes, ergot, lupuline, castoreum, digitalis, Artemisia santonica, nux vomica, arnica, myrrh, opium, ipecacuanha, Rheum indicum, gamboge, etc.

[*Lupuline* is a substance obtained from the common hop (*Humulus lupulus*). It exists in the form of small glands, or grains, adhering to the surface of the scales which inclose the fruit of the hop, and is separated by rubbing or threshing, and sifting the hops. It is a yellowish powder, which contains a volatile oil, a bitter principle, tannic acid and a resin, and its effects upon the human system are aromatic and tonic, and according to some, slightly narcotic.

Castoreum is an ill smelling substance produced by the beaver (*Castor fiber*), and is found in two small glands or sacs which are attached to the abdomen of the animal. It is a substance of a brown or reddish brown color, and unctuous consistence. Chemical examinations of castoreum have been made by several Chemists; but of these, the most interesting results were obtained by Wöhler and Pereira. Wöhler found in it a small quantity of *phenole* or *spirole*, the substance described in another note (Class 2, No. 7,) as having been introduced largely into the market, under the name of *creosote*. Wöhler considers the odor of castoreum to be partially, if not wholly, due to phenole. He also found in it *salicine*, the crystallizable principle of willow bark (note to No. 92, Class 2), and Pereira found in the water distilled from castor, the *hydruret of salicyle*, or oil of meadow-sweet, which is a derivative of salicine. Pereira suggests that the phenole and oil of meadow-sweet are both derived from salicine, and points out the obvious origin of the salicine in the willow and poplar barks upon which the animal subsists. The medicinal effects of castoreum, which are probably due, wholly or partially, to the phenole, are stimulant and antispasmodic. It was once in great repute as a remedy for hysteria and epilepsy, but now, on account of its bad taste and smell, high price, and variable quality, has fallen into disuse.

Arnica montana (Leopard's bane) is a plant of the order Compositæ, which grows in mountainous districts in Europe, Asia and North America. Its medicinal effects on man are those of an acrid, a stimulant to the whole nervous system, a diuretic and diaphoretic. It is not much used by physicians.

Myrrh is a resinous exudation from the bark of *Balsamodendron myrrha*, which is brought from India, being collected in Arabia and Abyssinia. It is in the form of irregular fragments or tears, from the size of a pea, up to two or three inches in diameter, of a reddish yellow or reddish brown color, of a peculiar aromatic agreeable odor and taste. Analysis indicates the presence of resinous substances and of a volatile oil. When administered in small doses, it increases the appetite, produces a feeling of warmth in the stomach, and slight constipation. In larger doses, this sensation of heat is increased, and a general febrile condition of the system is produced.

Ipecacuanha, usually called by contraction, *ipecac*, is the root of *Cephaëlis ipecacuanha*, which grows in Brazil. It contains an alkaloid called *emetine*, which is white, uncrystallizable, and has exceedingly powerful emetic properties. Two grains killed a dog, and 1-16th of a grain caused vomiting in a man. It is inodorous, and nearly tasteless. Ipecacuanha is used as an emetic, being particularly adapted for delicate and debilitated patients, on account of the mildness of its action.

Gamboge, is the resinous exudation of an uncertain species of *Garcinia*, and is brought to us from Siam, and Cochin China. It consists principally of two substances, a yellow resin and a gum. The gum is soluble in water, but the resin insoluble, and gamboge therefore forms, when mixed with water, a yellow emulsion. Gamboge is cathartic and diuretic in small doses, and in large doses an acrid poison. It is much employed by physicians, and is also used in water-color painting.]

13.—Rushton, Clark & Co., 165 *Broadway, New York City.*—Manufacturers.

Medicine Chests and medicinal preparations. Cod liver oil.

[Cod liver oil, *Oleum jecoris aselli*, or more properly *Oleum morrhuæ*, is obtained, usually by the aid of heat, from the liver of the common cod, *Morrhua vulgaris*, and from allied species. The purest and lightest colored oils are obtained by heating the fresh livers by steam; the darker and more offensive varieties, generally known as *currier's oil*, are obtained after the livers have begun to decompose. A fine oil is sometimes obtained by expression.

It contains a peculiar substance called *gaduine*, which is supposed to be of biliary origin; oleic, margaric, butyric, and acetic acids; various biliary principles, fellinic acid, etc.; iodine, chlorine, bromine, phosphorus, lime, magnesia, soda, etc. Among all these substances, it is difficult to say to which its active properties are due; the proportions of iodine and bromine are so small that its virtues cannot be ascribed to them.

Its use in medicine seems to have been taken from the Baltic fishermen, among whom it has been long famous in the treatment of rickets, and various scrofulous complaints. Since 1841, its use has greatly extended, and it is now considered one of the most efficient remedies in chronic rheumatism, and diseases connected with a scrofulous diathesis.

There is some difference of opinion as to its mode of action. It is a powerful nutritive agent; and besides this property, it seems to have a *special* action, increasing the albumen and diminishing the fibrine. The most probable supposition is, that it exerts the same influence as a medicine that it does in the liver of the fish, by modifying the processes of assimilation and nutrition, and causing the formation of healthy issue, instead of the amorphous albuminous products, known as *tubercle*.

14.—Elmer and Hendrickson, *No. 15 West 34th St., New York City.*—Manufacturers.

Preparations from various medicinal plants.

15.—Ayres, G. C., Lowell, *Massachusetts.*—Manufacturer.

Pills, manufactured and coated with sugar, by machinery.

16.—Lyon, Emanuel, 424 *Broadway, New York City.*—Manufacturer.

A powdered vegetable substance, used for the destruction of vermin, said to be free from all kinds of mineral poison, and to be innoxious to mankind, although fatal to insects.

17.—Wills, Charles, 50 *East Thirteenth Street, New York City.*—Manufacturer.

Veterinary medicine chest.

18.—Altea & Gillespie, *Freeport, Pennsylvania.*—Manufacturers.

Bromine

[It is a peculiarity of many of the salt springs of our western country to contain an unusually large quantity of *bromine*, and very little *iodine*, reversing the relative proportion of these two substances which is found in sea water, and most other mineral waters; the iodine being generally very much in excess over the bromine. In fact, so much bromine is there in these western waters, that it will ultimately become a considerable source of wealth to the country, whenever a sufficient demand shall have been created for this substance, which is sure to happen sooner or later, as new and important uses will inevitably be found for a substance of chemical characters and relations so peculiar and striking as those of bromine. Bromine is an elementary substance, discovered in 1826, by Balard, of Montpellier, in the liquid left after the evaporation and crystallization of the salt from sea water. It occurs in small quantity also in most mineral waters, in many sea plants and sea animals, in some land plants, and in some minerals, especially the argentiferous ores of Mexico. In a pure state it is a very dark red heavy liquid, of so deep a color as to be opaque except in thin layers. It is nearly three times as heavy as water. At 13° F. below zero, it freezes to a yellowish brown, brittle, crystalline solid, which in some places is lead-gray. It boils at 117° F., and at the ordinary temperature, gives off deep red vapors, which have a very disagreeable odor (whence its name), and a very corrosive action upon the bronchial apparatus. Of all substances, bromine is probably the most destructive to animal tissues A drop coming into contact with the flesh, produces a deep ulcer, and even the vapor, wherever it comes into contact with the skin, will sometimes produce sores which last for months. Starch forms with bromine a compound of a deep yellow color, very distinct from the deep blue compound formed with iodine. In medicine, bromine is used for the same purposes as iodine, appearing to have the same therapeutical effects, and even greater activity. These exhibitors manufacture their bromine from the "bittern," or residual liquid after the separation of the salt from the water of a brine spring. The demand for their product amounts at present to about 300 lbs. *per annum*, and is of course increasing. They obtain by the ordinary process of manufacture two pounds and eight ounces of bromine from thirty gallons of the bittern. They have examined the bittern of many other springs in their vicinity, and in Virginia, and state that they yield equally well, while some springs yield several hundred gallons of bittern per day. The quantity of iodine which they obtain from the same quantity of bittern, is not more than half an ounce. Bromine, besides its use in medicine, is used to some extent in photography. It has also been used in the form of bromide of potassium for the purpose of falsifying iodide of potassium.]

19.—Hendrickson, George R., 27 *Barclay Street, New York City.*—Manufacturer.

Double refined saltpetre, or nitrate of potash, in very large crystals.

[The uses of saltpetre are various, but of course the principal consumption is for the manufacture of gunpowder, and especially since the introduction of the Peruvian product called Chili saltpetre, or nitrate of soda, which has replaced it for the manufacture of sulphuric and nitric acids. The manufacture of common saltpetre from the less valuable nitrate of soda, is now practised to a large extent in Europe, the former being produced by the reaction of the latter upon commercial carbonate or sulphate of potash or chloride of potassium. In the manufacture of good gunpowder, which contains about 75 per cent. of saltpetre, it is necessary to use it in a highly purified or refined form, and this refining is accomplished by recrystallization, and by washing with water which is already saturated with saltpetre, and which of course, while still retaining its solvent power for the salts which contaminate the mass, is not capable of dissolving any more of the saltpetre itself.]

20.—Nichols, George H., *Salem, Massachusetts.*—Manufacturer. (Agents, Wm. T. Hicks & Co., 214 *Pearl Street, New York.*)

Alum in large crystals, and crystallized sulphate of copper.

21.—Pearin, John D., *Brooklyn, New York.*—Manufacturer.

Nitric acid, chlorohydric or muriatic acid, protochloride and bichloride of tin, aqua ammonia.

22.—Lenoy, Louis, 771 *Broadway, New York City.*—Manufacturer.

Crystallized biborate of soda (borax). Tartaric acid. Sulphate of copper (blue vitriol). Arseniate of potash. Crystallized mannite. Citrate of iron. Prussiate of potash. Prussian blue. Cyanide of potassium. Acetate of zinc.

[*Mannite* is a crystalline substance which sometimes forms 75 per cent. of the drug called manna, the concrete juice of two species of ash, *Fraxinus rotundifolia* and *F. ornus*, which is collected in Sicily, and other islands in the Mediterranean. Mannite is also found in a great many other plants, as many varieties of cherry and apple trees, in the sap of *Pinus larix*, and other pines, in the pomegranate tree, in the bark of *Canella alba*, in various fungi, as *Cantharellus esculentus* and *Clavellaria coralloides*, the so-called *mushroom sugar* being mannite. Stenhouse has also found it in a great number of seaweeds. Mannite crystallizes in small four sided prisms, and has a feeble sweet taste, which is nauseous to most persons. It dissolves easily in water, and forms, like sugar, a thick syrup. Its composition, however, differs very much from that of sugar. The medicinal operation of manna upon the human system is, in small doses, nutritive, but in larger ones, gently purgative; it depends upon the mannite. The longer manna is kept, the more purgative it becomes. On account of its sweet flavor, and the mildness of its operation, it is frequently preferred to other purgatives for administration to women and children.]

23.—Schols, Frederick, *Kent Avenue, Brooklyn, New York.*—Manufacturer. (Agent, James Dixon, 41 *Barclay Street, New York.*)

Refined sulphur in rolls and blocks.

The price of crude brimstone ranges in the American market, from $35 to $55 per ton; and that of refined sulphur from 2½ cents to 3 cents per lb.

24.—Jeffries & White, 145 *Maiden Lane, New York.*—Manufacturers.

Refined sulphur in rolls and in large blocks.

[Sulphur is one of the elements of matter, so called by chemists because no one has yet succeeded in separating from it any substance differing in nature from itself. Almost all the sulphur of commerce is brought from Sicily, where it is found as a product of volcanic action. It is, however, one of the most widely distributed of all the elements. It forms an essential ingredient in the substance of animal tissues, and must therefore exist uniformly in the aliments of animals, that is in vegetable tissues, and, as a necessary consequence, in the aliments of plants, or in the air, waters and soils. The water of the sea contains it in several forms of combination; it has been found in various minute quantities in the waters of most springs and rivers, and even in fresh rain water it may be detected with proper precautions. In the atmosphere it is undoubtedly present in most localities near the earth's surface, and may be found in all fertile soils, and in most rocks, while in many of the latter it exists in various forms of combination, in veins, or in isolated masses, sometimes of great magnitude. The common mineral *iron pyrites*, is a sulphide of iron, while the still more common *gypsum*, is a sulphate of lime. The most abundant metalliferous ores are also mostly sulphides. Sulphur is an element of immense importance, not only to the chemist, but also to the whole civilized world. Its applications, direct and indirect, in the arts, are almost too numerous to mention. Directly, it is used in the manufacture of gunpowder, of friction matches, of ultramarine (see the Record, p. 86), of bisulphide of carbon (see note to Class 2, No. 96), in the sulphidizing, or so called "vulcanizing," of caoutchouc and gutta percha, etc. (see note to Class 28, No.). Its indirect uses are principally in the form of sulphuric acid (see note to Class 2, No. 1). The quantity of crude sulphur annually mined in Sicily, is supposed to approach 100,000 tons. The refining, which consists essentially of a distillation or sublimation, is carried on here. Every one knows the appearance and general properties of refined sulphur. The two forms in which it is brought into the market, namely, the roll or block brimstone, and the "flowers" of sulphur, are due to the different temperatures at which it is condensed after distillation; thus, when the temperature is low, it condenses in the solid form, as "flowers," but when the condenser is kept heated above the fusing point of sulphur, it of course condenses as a liquid, and is then cast into sticks and blocks. When obtained in the finest possible state of division, as when precipitated from a liquid which holds it in solution, sulphur is as white as milk, and hence such a preparation goes by the name of "milk of sulphur." When crystallized out from a solvent, sulphur may be obtained in the form of beautiful amber yellow *transparent* crystals of a brilliant lustre, and in a crystalline form entirely different from that of the common opaque brimstone. Sulphur therefore, like carbon (see note to Class 1, No.), is *polymorphous*. Native sulphur in this transparent crystallized form is often found, and specimens of it, artificially prepared, are exhibited by Messrs. Powers & Weightman (Class 2, No. 1). Sulphur also exhibits other indications of polymorphism, thus, if it be heated to 232° F., it melts, and becomes as fluid as water; but if the heat be now increased to 324°, the liquid begins to grow thick, and acquires a reddish color; at about 430°, it is so thick that the vessel containing it may be turned upside down, without spilling it. If now the sulphur, at or above the latter temperature, be thrown into water, and thus suddenly cooled down, it will be found, on taking it out of the water, to have undergone a singular modification. It is still sulphur, and chemically the same as before, but instead of being opaque and brittle, it is now transparent, plastic, and somewhat elastic, resembling jelly. It retains its gelatinous condition and transparency for a short time, but gradually returns to the condition of ordinary brimstone. While in this plastic condition sulphur has been used for taking impressions of coins, medals, seals, etc., which it retains upon hardening, and can be used after being rubbed over with graphite, for taking electrotype casts identical with the original.]

25.—New England Glass Co., *Boston, Massachusetts.*—Manufacturers.

Carbonate of potash, litharge, red lead

26.—Studley, Wm., *Cedar Creek, Wisconsin.*—Manufacturer.

Pearlash.

[Pearlash is merely common potash which has been made less caustic and deliquescent by being combined with more carbonic acid, and has also undergone an imperfect process of purification, to which it owes the comparative degree of whiteness which has given rise to its name. For household purposes, it has for many years been replaced in this country by the preparation called *saleratus*, which contains still more carbonic acid, and when of the best quality, twice as much as pearlash, being in fact *bicarbonate* of potash, whereas pearlash is the neutral carbonate. Pearlash is used for bleaching and other purposes in the arts.]

27.—Grinnell, Lawrence, *New Bedford, Massachusetts.*—Manufacturer.

Salæratus.

28.—Andrews, Thomas, 136 *Cedar Street, New York City.*—Manufacturer.

SPECIMENS OF SALÆRATUS.

[There are two kinds of salæratus known in our market, one called pearlash-salæratus, and the other soda-salæratus, the former being made by exposing purified pearlash to the action of carbonic acid gas, and hence being essentially a bicarbonate of potash, and the latter by exposing commercial carbonate of soda (called in the market "sal-soda") to the same agent, being therefore principally bicarbonate of soda. The word salæratus signifies literally *ærated salt*, and evidently originated from the mode of production of these substances. These products are used by bakers and housekeepers, together with some acid substance, such as cream of tartar, sour milk, etc., for mixing with flour, for the purpose of evolving carbonic acid gas from the bicarbonate on the addition of water, vesicles of this gas being thus engendered throughout the mass of dough, which, on exposure to the heat of the oven, expand, and render the product light and spongy. They are also used to some extent by manufacturers who require a mild alkaline substance for certain bleaching purposes.]

29.—Ruffner, Donally, & Co., *Kanawha Salines, Virginia.*—Manufacturers.

SAMPLES OF BRINE, BITTERN AND SALT.

The following facts and statistics are given with regard to the salt manufacture at the Kanawha Salines in Virginia. The brine is procured from borings from 800 to 1200 feet deep, and generally pumped out by steam, but in two or three of the wells, it is forced up by the pressure of confined gas, in one case to a height of 200 feet above the surface. The gas alluded to is carburetted hydrogen, and its value is very great to the manufacturer, since it is found to be sufficiently abundant to supply the place of fuel under the evaporators, saving in many cases all the coal which was formerly required. There are now in operation 28 furnaces for evaporating the brine, and the quantity of salt made is shown as follows, by the returns of the inspectors of salt as certified by the Clerk of the County Court of Kanawha County. The bushel contains 50 lbs.:—

For the year	1849,	to the 20th of March,	2,855,920	bushels,		
"	"	1850,	"	"	3,251,492	"
"	"	1851,	"	"	2,983,471	"
"	"	1852,	"	"	2.862,686	"
"	"	1853,	"	"	2,645,007	"

The salt is shipped extensively to the West and South West, on the Ohio and Mississippi Rivers, and their tributaries, the price varying, as it is generally shipped on account of the manufacturers themselves. The price for limited quantites sold at the works is 25 cents per bushel. The *bittern* is known to contain iodine and bromine, especially the latter, in large quantity, but is at present entirely thrown away.

30.—Brewster, Samuel, C., *Geddes, Onondaga County, New York.*—Manufacturer.

COARSE SALT, CRYSTALLIZED BY SOLAR EVAPORATION.

[*Common salt* is a compound of chlorine and the metal sodium, which is found very widely distributed over the earth, and is one of the most important of all minerals to mankind. Besides being among those aliments of animals which are indispensable to their healthy condition, and its use for the preservation of food, it is the source of many manufactured products of the highest importance to civilized life, such as *soda*, upon which depend the manufactures of glass and soap; bleaching salt, the value of which in the manufactures of textile fabrics, paper, etc., is so great; and various other substances more or less useful. The manufacture of salt therefore is a very important branch of technology, and is practised to a greater or less extent in almost every inhabited country where the materials are provided by nature. These materials are in some localities furnished by great beds of native salt deposited in the earth in some former geological epoch; the salt in these mines being sometimes pure enough for use without any preparation, and in other cases requiring to be purified by dissolution in water and crystallization. In many countries the only source offered is the brine of the ocean, which contain about 25 per cent. of chloride of sodium, and on sea coasts where the mean surface evaporation considerably exceeds the quantity of rain that falls, salt is obtained from this source by means of the heat of the sun. But in many inland districts, which are thickly populated by an agricultural people, and consequently require a large quantity of salt, and where the materials for the manufacture are offered in the shape of natural springs, the water of which contains a large percentage of salt, and where fuel is cheap, it is found more advantageous to boil down the brine of the salt springs by means of artificial heat, than to transport salt from the coast. Such a district is that of central New York, where the salt springs of the Onondaga salt group furnish any desired quantity of strong brine, where fuel is cheap, and where the rapid increase in the population of one of the richest agricultural countries in the world, promises an indefinite increase in the demand for salt, the market being at the very doors of the factories.

The variations in the quality of commercial salt are worthy of notice. All native brines contain more or less of two other compounds, the chlorides of calcium and magnesium, which are very *deliquescent* and therefore communicate to the salt the property of becoming moist in damp air. It is curious, however, that this deliquescent salt, although entirely unfit for the table, is preferred, for some purposes, to pure salt, the foreign chlorides having a stronger salt taste than pure chloride of sodium, and such salt is therefore actually salter than pure salt. It is said also to be more antiseptic than pure salt. The Onondaga brine is not much impregnated with the deliquescent chlorides, and the salt made from it should, with proper management, be quite pure. The following statement of the increase in the salt manufacture of Onondaga Co., since 1797, will show in the strongest light, the future prospects of this branch of industry.]

Date.	No. of bushels.	Duty per bushel.	Price per bushel.
1797	25,474	4 cents.	
1798	57,928	"	
1799	42,574	"	
1800	50,000	"	60 cents.
1801	.....	"	
1802	75,593	"	60 "
1803	90,335	"	
1804	.....	"	
1805	154,071	"	60 "
1806	from April 25, ... 122,557	"	
1807	165,448	"	40 "
1808	{ to April 13,..... 131,808 } { from April 13,... 187,872 }	"	60 "
1809	from June 14,..... 128,282	"	
1810	450,000	"	40 "
1811	200,000	May 1, 3 cents.	
1812	221,011	"	28 "
1813	226,000	"	44 "
1814	295,215	"	50 "
1815	322,058	"	30 "
1816	348,234	"	25 "
1817	448,665	August 12½ cents.	25 "
1818	406,540	"	
1819	526,049	"	25 "
1820	548,374	"	18¾ "
1821	458,329	"	12½ "
1822	481,562	"	15 "
1823	726,988	"	16¾ "
1824	816,634	"	14 "
1825	757,203	"	
1826	811,023	"	
1827	983,410	"	
1828	1,160,888	"	
1829	1,291,280	"	
1830	1,435,446	"	
1831	1,514,037	"	
1832	1,652,985	"	
1833	1,838,646	"	
1834	1,943,252	6 cents.	13 "
1835	2,209,867	"	
1836	1,912,858	"	
1837	2,161,287	"	
1838	2,575,083	"	
1839	2,864,718	"	
1840	2,622,305	"	16 "
1841	3,340,769	"	
1842	2,291,903	"	
1843	3,127,500	"	11 "
1844	4,003,554	"	7⅓ "
1845	3,762,358	"	8½ "
1846	3,833,581	April 20, 1 cent.	9 "
1847	3,951,351	"	12½ "
1848	4,737,126	"	11 "
1849	5,083,369	"	10 "
1850	4,268,919	"	9 "
1851	4,614,117	"	9 "

31. Paoli, Christian,—Manufacturer. (Agent, Lewis J. Magnusson, *Springfield Ohio.*)

Pure deodorized alcohol, for medical and chemical purposes, free from fusel oil and all other unpleasant and deleterious ingredients.

[The manufacture of alcohol in this country has of late years reached a great development, and the price of the article has in consequence become very low. The principal primary sources from which it is obtained are Indian corn, potatoes, apples and molasses The greater portion of our alcohol is probably made, however, from corn. The corn is first subjected to a process of maltiog, or artificial germination, by which the starch which it contains is converted into sugar; an infusion of this malt is then fermented with yeast, the fermentation consisting of a breaking up of the sugar into alcohol and carbonic acid, which latter escapes in the form of gas. The alcoholic liquid is then distilled, and the first product, known under the name of "corn whiskey," is redistilled or rectified in stills of peculiar construction, by which it is reduced to the commercial strength of 95 per cent. of alcohol to 5 per cent. of water. Alcohol thus made, always retains a nauseous odor and flavor, which is due to the presence of certain substances, which approach to alcohol in their degree of volatility, derived from the whiskey. These substances, the nature of which has never been thoroughly investigated, are probably ethers of the ethylic and amylic series, possibly valerates, butyrates, &c., due to the action of minute quantities of these acids upon the alcohol, and upon a little fusel oil which is always present, being produced by some collateral metamorphosis of sugar, or other ingredient of the malt, during the fermentation. All these ethers have very powerful odors and tastes, and very minute traces of them are sufficient to communicate their own odors to alcohol, which, when pure, is almost wholly destitute of odor. Some of them have also powerful medicinal properties. It is therefore of great importance that alcohol should be made for the use of the perfumer, apothecary, liquor and cordial manufacturer and others, free from these ethereal compounds, and the article of this exhibitor purports to be of this character. A method used by some for deodorizing alcohol is to distil it with a small quantity of permanganate of potash or some other powerful oxidizer, by which the ill-smelling ethers, which are all more oxidizable than alcohol itself, are burnt up.—H.W. An entirely novel method of rectifying alcohol without heat or distillation has lately been patented by a Cincinnati manufacturer. It is found when dilute

alcoholic fluids are permitted to stand in very tall vessels for some time entirely at rest, that a separation takes place under the influence of gravity. The upper stratum becomes alcohol as strong as can be prepared by distillation, while the water falls to the lower parts of the vessel. For this purpose it is proposed to employ cylinders or large tubes of copper set like columns in a vertical position, one hundred feet high, and one foot or thereabouts in diameter. These are filled by a flow pipe situated centrally, and after a certain time water nearly free from alcohol is drawn off from the lower orifice, and high proof alcohol from the upper. This wholly unexpected result was an accidental discovery.]

31a. Lill, William & Co., *Chicago, Illinois.*—Manufacturers.

Pure deodorized alcohol for manufacturing perfumery and for medical purposes, made by means of the patent steam Rectifying Machine, invented by Chas. Delescluse of New York.

32. The Shakers of *Shaker Village, New Hampshire.*—Manufacturers. (Agent, David Parker, *Shaker Village.*)

Essential oil of wintergreen, or *Gaultheria procumbens.* Medicinal extracts. This oil of wintergreen, which is somewhat turbid and deposits a sediment in diffused daylight, becomes as clear and colorless as water when exposed to the light of the sun, this effect being independent of the *heat* of the sunshine, and produced in some way by the action of *light.*

[The *Gaultheria procumbens* is exclusively an American plant, which is indigenous over a large tract in the United States and Canada. It is a small evergreen shrub, which generally grows in the shade of larger shrubs in barren mountainous places, and is impregnated throughout with a volatile oil possessing a strong and highly agreeable odor, which has been found by Professor Proctor to be identical with the essential oil contained in the bark of the sweet birch (*Betula lenta*). It is among the heaviest and least volatile of the essential oils, being heavier than water and boiling at about 402° Fahrenheit. According to the elegant researches of the French chemist, Cahours, this oil is a mixture of two substances, one of which is called *Gaultherilene*, and belongs to the large class called *camphenes*, or substances which are of the same chemical composition as oil of turpentine, oil of lemon, &c., while the other, which forms very nearly the whole of the mass, is one of those substances, the number of which is now being increased every day, which chemists have succeeded in producing artificially. In fact, one of the compound ethers or oxygen-salts of organic radicals, which may be generated artificially in various ways, called *salicylate of oxide of methyle*, is identical in smell and taste, and, according to Cahours, in chemical composition and properties, with oil of wintergreen. The property which this sample of the oil is stated to possess by the exhibitors, of becoming turbid in the dark, and clear in the light, without any influence of heat, is entirely inexplicable upon any known principle.]

33.—Hotchkiss, H. G. and L. B., *Lyons, Wayne County, New York.*—Manufacturers.

Oil of peppermint, oil of spearmint, oil of wintergreen, and specimens of the crystallized stearoptene of oil of peppermint.

[Oil of peppermint, like many other volatile oils, consists of two substances, the one liquid and the other solid and crystallizable. The latter is called the stearoptene of oil of peppermint, or, more generally, *peppermint-camphor.* It has been analyzed by Dumas and others, and found to be identical in composition with the liquid part of the oil, and these are both identical in composition, or *isomeric*, with common camphor. Peppermint camphor crystallizes out, when crude American oil of peppermint is exposed to cold, in colorless prisms, which have the smell and taste of peppermint.]

34.—Delluc & Co., 581 *Broadway, New York City.*—Manufacturers.

Flavoring extracts. Vanilla, orange, pineapple, strawberry, etc.

35.—Tyson, Jesse & Co.

Bichromate of potash.

[This, together with all other chromium compounds used in the arts, is made from the mineral called chromic iron, which is composed of the oxides of chromium and iron. In the manufacture of bichromate of potash, this mineral is pulverized, mixed with lime, and the mixture roasted in a current of air. In the presence of lime, the oxide of chromium acquires the power, which alone it does not possess, of combining with more oxygen from the air, and becoming chromic acid, which then combines with the lime, so that the whole is finally converted into a yellow mass of impure chromate of lime. This is then boiled with a solution of carbonate of potash, by which it is converted into carbonate of lime, while the carbonate of potash is converted into neutral yellow chromate of potash, which remains in solution. To the solution is then added just half enough sulphuric acid to decompose entirely the chromate of potash, the liquid then evaporated, and the bichromate of potash separated from the sulphate, by crystallization. Bichromate of potash crystallizes in very large prisms of a brilliant red color. It is the source of the chrome pigments, and is also itself used for various purposes. Thus in admixture with sulphuric acid it is used as a powerful oxidizing agent for bleaching oils and fats. It is also used in dyeing.]

36.—Worthington, H. W., *Kensington Chemical Works, Philadelphia.*—Manufacturer. (Agents, John Farnum & Co., *Philadelphia.*)

Large crystals of yellow prussiate of potash. This product is manufactured by the exhibitor to the extent of 150,000 lbs. per year. The estimated annual production in the United States is from 400,000 to 500,000 lbs., and the average market value is 30 cents per lb.

[This substance is best prepared, as follows:—A mixture of potash or pearlash, as free as possible from sulphate of potash, with any cheap nitrogenized animal substance, such as horn waste, hoofs, tallow waste or "cracklings," woollen rags, dried blood, hair or leather cuttings, or preferably, with any of these substances previously carbonized, is heated in a closed iron crucible to a high red heat, the mass after cooling lixiviated with water, and this solution digested by a gentle heat, with iron filings or borings, until no more hydrogen gas is given off. The solution, on evaporation and crystallization, will give the yellow prussiate of potash, or ferrocyanide of potassium, as it is sometimes called. The theory of the composition and formation of this substance, as elucidated by the researches of Liebig, is so complex that it must be omitted here. Yellow prussiate of potash crystallizes in large lemon-yellow tabular crystals, which belong to the dimetric system and have an eminent basal cleavage. It has a sweetish, salt and bitter taste, and is very poisonous. As it occurs in commerce, it is frequently falsified with carbonate of potash, which may be detected by means of turmeric paper, which is reddened by it, while pure ferrocyanide of potassium has no action upon test paper, being perfectly neutral. It is used chiefly in the manufacture of Prussian blue, and in dyeing. Of late years, it has also been quite largely used for the manufacture of cyanide of potassium, by the method of Liebig, for use in the new art of electro-plating with gold and silver. Nothing can illustrate more forcibly the advance of the arts of electro-plating, and other arts in which prussiate of potash is used, than the following table, showing the progress of the manufacture of prussiate of potash in Great Britain, and the alterations in its price, through a series of years. The annual production

From	1825	to	1830	about	10 tons, at	5s. per lb.
"	1830	to	1835	"	40 "	2s.6d. "
"	1835	to	1840	"	200 "	1s.4d. "
"	1840	to	1845	"	700 "	1s.4d. "
"	1845	to	1850	"	1040 "	1s.3d. "

37.—Cuno, Krause & Co., *St. Louis, Missouri.*—Manufacturers

Chrome green, chrome yellow, indigo, wash blue, Chinese blue, Prussian blue.

38.—Roux, John, 2 *Cliff Street, New York.*—Manufacturer.

Carmine, chrome green, chrome yellow and varnishes.

39.—Bell, James, A. H., 149 *Maiden Lane, New York.*—Manufacturer.

Chinese blue, chrome green, American vermilion, and Paris green.

40.—Brumlen, Ludwig, *Poughkeepsie, New York.*—Manufacturer. (Agent, D. Sarfati, 176 *Water Street, New York City.*)

Paris green and sulphate of copper.

41.—Hainemann Brothers, 269 *Twenty-eighth Street, New York.*—Manufacturers.

Five varieties of chrome green, three of chrome yellow, Prussian blue, Chinese blue, and six varieties of Paris green.

[Chrome green, when pure, is *anhydrous sesquioxide of chromium*, but the commercial article is often so much falsified that little of the chromium compound can be found in it. The fineness of the color depends entirely upon the mode of the manufacture, and many precautions are necessary in order to obtain a good chrome green. *Chrome yellow* is a compound of chromic acid and oxide of lead, which is found native in several localities, forming the mineral called *red lead ore*, or *crocoisite.* In this form it has a bright hyacinth red color, but when in the form of a fine powder, as artificially obtained, it is of a bright lemon-yellow color. It is obtained by precipitating a solution of acetate or nitrate of lead with either the yellow chromate, or the bichromate of potash. Also by treating white lead which is the carbonate of lead, (or sulphate of lead, according to Liebig), with a solution of chromate of potash. When melted by a red heat and cooled again, it forms a dark brown mass, which gives a brownish powder, but if poured into cold water while melted, it forms a red mass, which gives also a red powder.

Prussian blue and *Chinese blue*, are varieties of the same preparation. They are prepared by adding a solution of ferrocyanide of potassium (see note to No. 36, Class 2) to a solution of the sulphate of sesquioxide of iron. A deep indigo-blue precipitate immediately falls, which, when collected, washed and dried, forms Prussian or Berlin blue. The composition and mode of formation of this substance, like those of ferrocyanide of potassium, cannot be elucidated to the unscientific reader.]

42.—Winchell & Cornell, 210 *East Nineteenth Street, New York City.*—Manufacturers.

Paris green, emerald green, chrome green, chrome yellow, Chinese blue, American vermilion, prussiate of potash.

[*Paris green*, and *emerald green*, are varieties of the same preparation, the latter being merely of a finer quality than the former. Other varieties are known under the name of "Brunswick green," "mountain green," "mineral green," "Schweinfurt green," "Vienna green," and various other names. They all consist essentially of *arsenite of copper*, and are properly called *Scheele's green*, after the great Swedish chemist, who discovered this compound. The preparation is very simple, and consists merely of adding a solution of *arsenite of soda* to a solution of *sulphate of copper*, washing and drying the siskin green precipitate produced. Of course, however, to obtain the finest shades of color, certain precautions, and modifications of the process, to be ascertained only by experience, are necessary, and the various names mentioned above, are applied to the products of such modifications. It is the production of this beautiful pigment which has, of late years, caused that great demand in commerce for the poisonous arsenious acid, at which surprise is frequently expressed by those who are unacquainted with the facts. Scheele's green is used for ornamental painting and paper-staining, and is now being employed for the latter purpose to so great an extent, that it behoves every individual in the community to be aware that the beautiful green papers, which are so common, are impregnated with *a deadly poison, which is given off in the form of vapor when such paper burns;* and it is

very easy to see that dangerous and even fatal consequences may arise from the accidental inhalation of such vapors, or even from *lighting a cigar* or pipe with a piece of such paper.

American vermilion is the incorrect term usually applied to a preparation which consists principally of *chrome red*, or *subchromate of lead*, and does not necessarily contain a particle of *true vermilion*, which is a *sulphide of mercury*. The reason why this preparation has received the name of *American vermilion*, not only in our own, but in foreign markets, is, that it was first manufactured of a fine color in this country, after a process discovered by Dr. Hayes, of Boston, which consists in melting together, in proper proportions, chrome yellow, the neutral chromate of lead, with saltpetre, or nitrate of soda, and washing out the yellow chromate of potash or soda which is formed in the mass. Chrome red made in this manner has a fine vermilion red color, but, of course, cannot be as permanent a pigment as vermilion, on account of the action of atmospheric sulphohydric acid, and sulphide of ammonium upon the oxide of lead, which forms its base.]

43.—Sinclair & Co., 169 *Front Street, New York City.*

Refined green paints, ground in oil.

44.—Springfield Serpentine Paint Co., *Springfield, Massachusetts.*—Manufacturers.

Various samples of paints.

[These pigments are manufactured under a recent patent, which was granted for a method of increasing the substance of the common pigments, such as chrome yellow, chrome green, etc., by the addition of a substance which on admixture with oil becomes transparent, and consequently while increasing the *volume* of the paint, does not screen the *color*, or act as a diluent of it, the object being to make a given quantity of paint cover a much larger surface. The substance used for mixing with the pigments is *amorphous silica*, in fine powder, prepared by the decomposition of the mineral *serpentine*, which is a hydrated silicate of magnesia, by diluted sulphuric acid. The sulphate of magnesia thus obtained in solution is crystallized, and sold as Epsom salt. It is stated that upon the drying of such paint the silica remains transparent still, and consequently does not even then mask or diminish the intensity of the color. If this be true, the improvement would seem to be as valuable as it is ingenious.]

45.—Kohnstamm, Joseph, 4 *Tryon Row, New York City.*—Manufacturer and Importer.

Ultramarine, seven varieties, used for printing calico and muslin, for lithographic printing, for making ink, for coloring ornamental paper, for oil painting, and for water-color painting, each variety being differently manufactured, and specially adapted for one of the above uses. Manufactured by the exhibitor.

Carmine-lakes, seven varieties, used for making printers' ink, for making *rouge*, and for different kinds of painting. Imported by the exhibitor.

[*Ultramarine*, see the Record, p. 86.]

[*Carmine-lakes* are compounds of the coloring matter of cochineal with alumina. Hydrate of alumina appears to possess a certain degree of affinity for the coloring matter of cochineal, as well as for many other organic coloring matters, removing them from their solutions, and rendering them insoluble. These phenomena are not to be attributed to any modification of chemical affinity, but rather appear to be due to the same sort of force by which animal charcoal, and many other solid bodies, presenting very great extents of surface, remove coloring matters, and many other matters, from their solutions, that is, to that Protean molecular force, called the *adhesion* of liquids to solid surfaces, and of solid surfaces to one another, which manifests itself in so many and various aspects, such as capillarity, endosmose, etc. For the red coloring matter of cochineal, properly called carmine, does not exhibit any tendency to combine with bases, so that an acid character cannot be attributed to it, and the compound with alumina is not definite. The best carmine-lake is made by mixing freshly-precipitated, washed hydrate of alumina, with a decoction of cochineal, in quantity sufficient to abstract all the carmeïne from the decoction and leave it colorless.]

46.—Deck, Isaiah, 113 *Nassau Street, New York City.*—Manufacturer.

Zinc-white, ultramarine, crystallized double sulphate of ammonia and oxide of zinc.

[*Zinc-white*, the *oxide of zinc*, is a pigment which is coming into use very largely for the same purposes as white lead, being considered a far more permanent color, on account of the blackening which the latter sooner or later undergoes from the action of the sulphuretted gases of the atmosphere. Another great advantage which it has over white lead is that it is not *poisonous*. Still it does not yet appear to be a perfectly satisfactory substitute for white lead, for notwithstanding the very large quantities of it in use, the demand for white lead still continues, and is even constantly on the increase. This is probably due to custom, and to the greater facility of its use by painters, over that of white zinc. It is to be hoped, however, that the universal use of zinc-white may yet banish from the community the most fruitful of all causes of the horrible lead diseases, which are of such frequent occurrence. The zinc-white of this exhibitor is one of the products of a new metallurgical process, invented by the exhibitor, for working the ore found in the Shawangunk mountain, near Wurtzboro', New York, which is a mixture of the sulphides of zinc, lead copper, and iron, with small quantities of cobalt and silver.]

47.—Hellmann W. H., 16 *Cedar Street, New York City.*—Manufacturer.

Bronze powders and silver leaf.

48.—Brandeis, Leopold & Co., 11 *Cedar Street, New York.*—Inventor and Manufacturer.

Bronze powders and metallic leaf.

Mr. Brandeis has furnished the following account of the history and present condition of his art:—

"The art of making *bronzes*, or to speak more correctly, of producing a metallic powder resembling gold-dust, was invented, according to my strict researches, in the year 1648, by Theophrastus Allis Bombergensis, a monk, in the town of Fürth, in Bavaria. He took the scraps, or cuttings of the metallic leaves, commonly called 'Dutch leaf,' the art of making which was previously known, and ground them with honey. This roughly made bronze powder was used for ornamenting the capital letters in parchment choral books, bibles, &c. After some years, the consumption of Dutch leaf increasing, and the nature and composition of metallic alloys being better known, the metal-beaters produced leaves of five or six different shades of color, and accordingly the scraps of these gave as many different colored bronze powders. The art of making bronze colors in Europe, is still extensively and almost exclusively practised at Fürth, with little or no improvement over the original invention. I will first describe the methods now used by the German manufacturers for making these substances, and will then show the superiority and greater cheapness of the American method. There are four different sorts of Dutch leaf; *common leaf*, which is soft, of a reddish cast, and composed of 25 or 30 per cent. of zinc to 75 or 70 per cent. of copper; *French leaf*, which contains more zinc, is therefore harder and less ductile, and has a purer yellow color; *Florence leaf*, which contains a large proportion of zinc, and is of a greenish gold color; and, lastly, *white leaf*, composed of tin. The more zinc these alloys contain, the harder and more brittle they are, and the more expensive to work, requiring more beating, and giving less perfect leaves. The manner of beating out these leaves differs little from that of making gold leaf. The scraps, or what is cut and brushed off when the leaves are laid between layers of paper, and made up into the form of books, constitutes the material from which the German manufacturers make their bronze powders. It is first brushed through a sieve, then ground with gum water on a marble slab for six hours, the gum then washed out, the different qualities assorted, dried, and a coating of grease given to them to make the particles more brilliant, and protect them against oxidation. To produce different shades of color, such as orange, etc., an artificial film of oxide or suboxide is produced upon the surfaces of the particles. The German manufacturer depends for his material entirely upon the supply of waste or scrap leaf, and very often, therefore the demand is greater than the supply, and prices change accordingly. The patented process of L. Brandeis & Co., is as follows: The metals used for making the bronze are copper and zinc. The copper is all obtained in the purest possible form by Voltaic precipitation, and is afterwards alloyed with the proper proportion of zinc according to the color required. The metal is then drawn out to a ribbon by fourteen inch rollers, annealed, and cut into pieces of the proper size, which then undergo a series of alternate rolling and annealing operations, till they finally pass through rollers of half an inch in diameter, when they become as thin as any metallic leaf. This leaf is then put into a powerful mill, worked by steam power, and ground. When finished, the bronze powder runs out into a basin, is washed and dried. It is then introduced into an airtight room, containing a series of tinned iron boxes, arranged in a particular manner. The air in the chamber is then set in violent motion by means of a large pair of bellows, so as to diffuse the powder throughout the chamber. The finest powder settles in the uppermost box, the next quality in the next box, and so on. After the whole has settled, each box is fitted with a tight lid, some *mineral varnish* having been previously introduced, and they are made to revolve rapidly for some time, by which means all the particles are coated over with the varnish, and the highest possible degree of metallic brilliancy produced. The different shades of color, such as flesh color, carmine, crimson, &c., are produced, previous to the varnishing, by the formation of films of oxide, of different thicknesses, by exposure for a certain length of time to a regulated heat. The number of men at present employed in the establishment of Brandeis & Co., is about twenty. All the operations are conducted by steam power, three small steam engines being employed. The average quantity of bronze powders manufactured is about three hundred pounds weekly, and the prices range from $4 50 per pound, downwards, according to the quality, the highest price being little above the cost of the raw material or scrap leaf in Germany, which is about $4 00 per pound. Bronze colors are now exported from this country to Europe, South America, and China. The principal uses of bronze colors are for japanning and bronzing tin and iron goods, railings, statues, chandeliers, gas fixtures, &c.; also for giving a brassy appearance to zinc and iron goods; for *papier maché* work; for wood, cloth, leather, oil-cloth, paper staining, printing, ornamental painting and lithography; for lettering signs and in a hundred other cases in which a cheap and brilliant metallic surface is to be produced. Brandeis & Co. have recently made an article purposely for the use of electro-platers, for coating a surface of any material, such as wax, plaster, &c., and rendering it a conductor of electricity. In the decorations of the Astor Library, of Taylor's Saloon in Broadway, and of the Crystal Palace itself, may be seen samples of their products."

49.—Bullock & Crenshaw, *corner of Sixth & Arch Streets, Philadelphia.*—Manufacturers.

Osborn's American water-colors.

50.—Hanington, William J., 365 *Broadway, New York.*—Manufacturer.

Colors and fluxes for the use of glass stainers and porcelain painters

51.—Dixon, J. & Co., *Jersey City, New Jersey.*—Manufacturers.—(Agents, Baldwin & Many 49 *John Street, New York City.*)

Black lead crucibles and furnaces for assaying, enamelling and other purposes. Graphite cylinders for Voltaic batteries.

These crucibles are used for melting gold, silver, copper, brass, steel and other metals, being far more durable and safe for these purposes than those made of any other material. The present condition of the manufacture of cast steel in this country is attributed to the

use of these crucibles, no other kind being able to endure the action of an anthracite coal fire.

52.—Phœnix Manufacturing Co., *Taunton, Massachusetts.*—Manufacturers.

Black lead crucibles and stove polish.

[The great incombustibility and infusibility of graphite (see note to Class 1, No.), vulgarly, and very incorrectly, called "black lead," makes it peculiarly suitable as a material for crucibles for melting metals, and it is therefore used for this purpose, being made plastic by being first ground finely, and then mixed with a sufficient proportion of fireclay Maugre the immense deposits of graphite which we have in this country, it is said that the material for crucibles is still brought from the island of Ceylon, our own graphite being generally not sufficiently granular and amorphous in its structure, and being on the contrary, of a laminated or scaly structure, which renders it impossible to grind it to a fine powder. The price of Ceylon graphite is now about $50 per ton.]

53.—Adee, Daniel, 107 *Fulton street, New York.*—Manufacturer.

Black lead crucibles.

54.—Seabury, J. & J. L. 156 *Chrystie street, New York City.*—Manufacturers.

Specimens of stove polish and black for coach painters; *terra di Sienna;* pure graphite or black lead.

55.—Youmans & Buadsall, 18 *Park Place, New York City.*—Publishers.

A Chart of Chemistry, representing the elementary principles and quantitative laws of the science to the eye by means of colored diagrams.

56.—Lienau, George A., 19 *S. Front street, Philadelphia, Penn.*—Manufacturer.

Artificial manure, proposed as a cheap substitute for guano.

GREAT BRITAIN.

57.—Kent J. H., *Stanton, near Bury St. Edmund's, Suffolk, England.*—Manufacturer.

EXT. Absinthii
" Aconiti Napelli
" Anthemidis
" Belladonnæ
" Chyraitæ
" Chelidonii Majoris
" Colchici Cormi
" " Acet.
" Conii
" Cotyledon. Umbil.
" Arctii Lappæ
" Digitalis
" Glycyrrhizæ Ang.
" Galii Aperine
" Hyoscyami
" Lactucæ
" Lupuli
" Menyanthis Trifol.
" Mercurialis Perennis
" Papaveris
" Rumicis Aquat.
" Rutæ Graveolentis
" Stramonii
" Solani Dulcam.
" " Nig.
" Scoparii
" Taraxaci
" Valerianæ
&c., &c.

FOLIA SICCATA.

Aconiti Napelli
Absinthii
Althææ
Agrimoniæ Eupatoriæ
Ari Maculati
Artemisiæ Vulgaris
Belladonnæ
Betonicæ Officinalis
Chelidonii Majoris
Conii Maculati
Chironiæ Centaurii
Digitalis Purpureæ
Daturæ Stramonii
Galii Aperine
Glecomæ Hederaceæ
Hyoscyami Nigri
Hyperici Perforati
Lamii Albi
Marrubii Vulgaris
Mercurialis Perennis
Menyanthis Trifol.
Malvæ Sylvestris
Matricariæ Parthenii
Rutæ Graveolentis
Tussilaginis Farfar.
Taraxaci
Tanaceti Vulgaris
Tami Communis

PULVERES.

Conii
Colchici
Digitalis
Hyoscyami
Sabinæ

DRIED FLOWERS.

Anthemis
Malva Sylvestris
Rosa Gallica
Sambucus Nigra
Tussilago Farfara
Papaver Rhœas
Viola
Cowslips

DRIED BARKS.

Daphne Laureola (*stem and root*)
Quercus Pedunculata
Ulmus Campestris

SEMINA.

Semina Colchici
" Conii
Semina Dauci Carotæ
" Papaveris Alb.
" Urticæ Dioicæ

DRIED ROOTS.

Aconum Napellus
Arctium Lappa
Geum Urbanum
Polygonum Bistorta
Polypodium Filix Mas
Taraxacum
Valeriana
Tamus Communis
Tormentilla Officinalis
Daphne Laureola
Colchicum Autumnale (*Corm.*)
Solanum Dulcam. (*Caules*)
Spartium Scoparius (*Cacumina*)
LIQUOR TARAXACI (*Pallidus*)

FLUID EXTRACTS.

Taraxacum
Papaveris Alb. } For making
" Rhœados } Syrups
Rumex Aquaticus
Arctium Lappa

PRESERVED JUICES.

Aconitum Napellus
Conium
Colchicum
Cotyledon Umbilicus
Digitalis
Hyoscyamus
Lactuca
Stramonium
Taraxacum
&c. &c.

58.—Smith, Thomas & Henay, 21 *Duke Street, Edinburgh, Scotland.*—Manufacturers.

CAFFEINE AND ALOINE.

[*Aloine* is a beautiful yellow crystallizable substance, which was discovered by these exhibitors in aloes, and which is the medicinal principle of the drug. Aloes is the inspissated juice of the leaves of various species of *Aloe.* Several varieties occur in this market, but two only are much esteemed; one of which, called "Cape aloes," comes from the Cape of Good Hope, where it is collected by the natives and Dutch residents; and the other, called Socotrine aloes, from the island of Socotra, in the Straits of Babelmandel. These two varieties differ very much in appearance. The first is in the form of masses of a yellowish color which is due to their being dusted over with powder of the drug, and when broken presents a smooth shining fracture of a dark greenish color approaching to black. The latter is in pieces of a yellowish or reddish brown color, the color being sometimes very light and sometimes brownish garnet red. The powder is of a bright golden yellow color. The odor of Cape aloes is disagreeable, while that of the other is rather pleasant. When taken internally in small doses, aloes "acts as a tonic to the alimentary canal, assisting the digestive process, and promoting the secretions, especially that of the liver, which organ it is thought to influence specifically." In large doses, it is purgative, acting very slowly but certainly.

59.—Howards & Kent, *Stratford, England.*—Manufacturers.

Pure sulphates of iron, zinc, magnesia, quinine, cinchonine and quinidine. Cinchonine and quinidine barks. Flat yellow, and quilled yellow barks. Quinoidine. Borax, carbonate of potash, and phosphate and bicarbonate of soda. Calomel, corrosive sublimate and red precipitate. Citric and tartaric acids. Rochelle salt, and ammonio-citrate and ammonio-tartrate of iron.

60.—Cooper, John, *Ashton, Cumberland, England.*—Manufacturer.

LARGE CRYSTALS OF SULPHATE OF MAGNESIA.

[*Sulphate of magnesia,* or "Epsom salt," derives its latter name from having been at one time obtained exclusively from the springs at Epsom in England, in the water of which it occurs in solution. It is of very frequent occurrence in a native form, constituting the mineral species called *Epsomite.* Thus it occurs in the Mammoth Cave in Kentucky, and in many other caves west of the Alleghany mountains, in very large masses. It exists in sea-water, and in some places, where common salt is made by the evaporation of sea-water, a great deal of Epsom salt is extracted from the residual liquid, which remains after the crystallization of the salt. By far the greater portion of the Epsom salt of commerce is made, especially in this country, by the action of dilute sulphuric acid upon the mineral *serpentine,* a silicate of magnesia. Epsom salt is the material from which the magnesia and carbonate of magnesia of commerce are prepared.—H. W.]

61.—Jennings, Thomas, *Brown Street, Cork, Ireland.*—Manufacturer.

Calcined magnesia, carbonate of magnesia and solution of bicarbonate of magnesia.

62.—Dinneford & Co., 172 *New Bond Street, London.*—Manufacturers.

SOLUTION OF BICARBONATE OF MAGNESIA.

[This is a form in which magnesia has been much administered, of late years, as a medicine, having a less unpleasant taste than most of the other magnesian preparations. It is made by dissolving carbonate of magnesia in water which is kept saturated with carbonic acid under pressure, and which, under such circumstances, takes up a very considerable quantity of the carbonate. Some natural mineral waters contain this compound in solution. The saturated solution of this compound under the pressure of the atmosphere, contains, according to Soubeiran, exactly twice the quantity of carbonic acid contained in the neutral carbonate. The solution has an alkaline reaction.]

63.—Trustees of the late J. Buckley, *Manchester, England.*

Large crystals of copperas.

64.—Cookson & Co., *Newcastle-upon-Tyne.*—Manufacturers.

Lead, antimony, sulphide of antimony, red lead, litharge, Venetian red.

65.—Hawthorne, James, 78 *Charrington Street, London.*—Inventor.

New preparations for staining oak, and mahogany, and samples of wood stained with them.

66.—Power, John, *Waterford, Ireland.*

Indigo and button blue.

67.—Ellam, Jones & Co., *Markeaton Mills, Derby, England.*—Manufacturers

Mineral colors, crude and manufactured, for painting and paper-staining, mineral yellow, ochres, Indian red, vermilion, burnt umber, &c. Specimens of emery in lumps and powder, varnishes, emery paper, &c.

68.—Rimmel, E. 39 *Gerrard Street, Soho, London.*—Manufacturer.

Essential oils, alcoholic extracts, soaps and artificial fruitessences. Extracts of jessa-

mine, rose, lily of the valley, rose geranium, sweet pea, magnolia, bouquet, jockey club, Jenny Lind, Balmoral, Victoria bouquet and Albert. Essential oils of caraway, peppermint, lavender, bitter almonds, verbena, geranium, citronelle and cassia. Essences of apple, jargonelle pear, pine apple and raspberry. Eau de Cologne, aqua mellis, lavender water, toilet vinegar, odontalgic elixir, instantaneous hair dye, aromatic vinegar, indelible ink, &c.

69.—Squire, Peter, 277 *Oxford Street, London.*—Manufacturer.
Solution of permanganate of potash, liquor taraxaci, solution of bimeconate of morphine.

70.—Garland, Thomas, *Fairfield Redruth.*—Manufacturer.
Specimens of arsenious acid, impure in lumps and pure in powder.

71.—Bramwell, Thomas, *Heworth Chemical Works, Newcastle-upon-Tyne.*—Manufacturer.
Yellow prussiate of potash.

72.—Hatmel & Ellis, 9 *Sugar Lane, Manchester.*—Manufacturers.
Sulphate of copper, nitrate of lead.

73.—Moberley, W., *Mulgrave Alum Works, Landsend near Whitby.*—Manufacturer.
Crystals of alum.

74.—Hills, F. C., *Deptford.*—Manufacturer.
Sal ammoniac and carbonate of ammonia.

75.—Lindsay, G., *Sunderland.*—Manufacturer.
Crystals of copperas.

76.—May & Baker, *Battersea, Surrey.*—Manufacturers.
Precipitated chalk; ponderous carbonate of magnesia; sulphate, acetate and oxide of zinc; white and red precipitates; prepared calomel; corrosive sublimate; tartar emetic; antimonial powder, and nitrate of bismuth.

77.—Scott, Langston, 41 *Moorgate Street, London.*—Manufacturer.
Oxide of zinc.

8.—Spence, Peter, *Pendleton Alum Works, Manchester.*—Manufacturer.
Refuse or burnt iron pyrites and patent zinc cement.

79.—Collins, Robert Nelson, *Oxford Court, Cannon Street, London.*—Inventor and Manufacturer.
Disinfecting powder.

80.—Burnett, Sir W., M.D., K.C.B., F.R.S., 53 *King William Street, London Bridge.*—Producer.
Disinfecting fluid.

81.—Wood & Bedford, *Leeds.*—Manufacturers.
Blue and red cudbear; blue and red archil liquor; archil paste and liquid ammonia FFF.

82.—Smith, B. T. & C., 12 *Church Street, Mile End New Town.*—Manufacturers.
Celestial blue; six varieties of Brunswick green; three varieties of chrome yellow; zinc yellow; Chinese red; emerald green and sal acetosella.

83.—Pontifex & Wood, *Shoe Lane, Fleet Street.*—Manufacturers.
White lead.

84.—Rowney, G. & Co. *Rathbone Place, London.*—Manufacturer.
Artists colors. Yellow ochre, emerald green, chrome yellow, Prussian blue, flake white, red lead, &c.

BRITISH COLONIES.

85.—Brennan, P., *Montreal, Canada East.*—Manufacturer.
Potash.

86.—Lyman, Wm. & Co., *Montreal.*—Manufacturers.
Raw and boiled linseed oils, Canada balsam, pulverized drugs, including ipecacuanha, jalap, India rhubarb, Turkey rhubarb, squills, Jamaica ginger, gamboge, Turkey opium, myrrh, scammony, cream of tartar, Cinchona bark and gall-nuts.

FRANCE.

87.—Menier & Co., 37 *Rue St. Croix de la Bretonnière, Paris.*—Manufacturers.
Thirty-four samples of pharmaceutical preparations; including powdered quassia, digitalis, liquorice, Rhei australis, ipecacuanha, aloes, hemlock and colocynth; iron reduced by hydrogen; sixteen varieties of medicinal extracts; samples of chocolate.

88.—Blancard, H., 12 *Rue de Seine, Paris.*—Inventor and Manufacturer.
Pills composed of protiodide of iron, so made as to be unalterable in the air.

89.—Reynal & Co., 32 *Rue Taitbout, Paris.*—Manufacturers.
Pectoral remedies, in the form of syrups, pastilles, &c.

90.—Lehuby, M.—Inventor. (Agent, M. Silberman, 154 *Rue Montmartre, Paris.*)
Medicinal envelopes (*Capsules en lichen*), composed of a digestible vegetable substance, for containing medicinal substances of unpleasant taste and odor.

91.—Zuber & Co., *Rixheim, Haut-Rhin.*—Manufacturers.
Seven samples of ultramarine.

92.—Guimet, J. B., 9 *Place de Carmes, Lyon, Department Rhone.*—Manufacturer.
Three samples of ultramarine. [*Ultramarine*, see the Record, p. 86.]

93.—Durif, Jean, *Lyon, Dep. Rhone.*—Manufacturer.
Two samples of ultramarine.

94.—Bonzel Brothers, *Haubordin, Dep. Nord.*—Manufacturers.
Ultramarine.

95.—Coste, ——, *Lyon, Dep. Rhone.*—Manufacturer.
Ultramarine.

96.—Lefevre, Sen., *Nantes, Department Loire inférieure.*—Manufacturer.
Two varieties of oxide of zinc, twenty-four kinds of varnishes.

97.—Camus, Charles, 2 *Rue Barbette, Paris.*—Manufacturer
Paris green.

98.—Thomas Brotheas, *Avignon.*—Manufacturers.
Samples of madder and garancine.

99.—Faure & Escoffier, *Avignon.*—Manufacturers.
Samples of madder and garancine.

100.—Vallie, H., *Paris.*—Manufacturers.
Seventy-nine varieties of colors for dying wool.

101.—Viard, Louis, 128 *Rue St. Martin, Paris.*—Manufacturer.
Thirty-six samples white lead and other colors.

102.—Serbat, L., *St. Saulve, Department Nord.*—Manufacturer
Cement.

103.—Pommier, Senior, *Paris.*—Manufacturer.
Five samples of varnishes.

104.—Soehnee Brotheas, *Paris.*—Manufacturers.
Twenty-three samples of variously colored varnishes.

105.—Eckman, Carton, 10 *Rue St. Andre, Lille, Department Nord.*—Manufacturer.
Powder for producing fermentation.

106.—Baocchieri, P., 21 *Rue Louis-le-Grand, Paris.*—Inventor.
Brocchieri fluid.

THE GERMAN STATES.

107.—Merck, E., *Darmstadt, Hesse.*—Manufacturer. (Agents, Haskell, Merrick and Bull, *No.* 10 *Gold Street, New York.*)

CHEMICAL PREPARATIONS.

1. Crystallized veratrine.
2. Menispermine.
3. Hippuric acid.
4. Digitaline.
5. Filicine.
6. Inuline.
7. Iodoform.
8. Theobromine.
9. Valerate of iron.
10. Sulphate of atropine.
11. Cantharidine.
12. Gentisine.
13. Chinic acid.
14. Pyrogallic acid.
15. Narceine.
16. Papaverine.
17. Sulphate of bebeerine.
18. Ononine.
19. Picrotoxine.
20. Valerate of magnesia.
21. " zinc.
22. Amygdaline.
23. Brucine.
24. Cubebine.
25. Santonine.
26. Succinic acid.
27. Jalapine
28. Veratrine.
29. Asparagine.
30. Atropine.
31. Meconine.
32. Narcotine.
33. Peucedanine
34. Phloridzine.
35. Valerate of quinine.
36. Acetate of morphine.
37. Gallic acid.
38. Chlorohydrate of morphine.
39. Mannite.
40. Tannic acid.
41. Sulphate of morphine.
42. Morphine.
43. Caffeine.
44. Cinchonine.
45. Chlorohydrate of cinchonine.
46. Salicine.
47. Strychnine.
48. Chlorohydrate of strychnine.
49. Codeine.
50. Nitrate of strychnine.
51. Sulphate of strychnine.

[This collection of almost unsurpassable preparations, exhibited by the celebrated pharmacographist and chemist, Merck, is principally made up of specimens of those substances which are called by chemists, the *crystallizable principles* of plants, a class of sub-

stances of the highest importance to mankind, it having been found by physicians that among them are to be generally found the *medicinal* vegetable principles. Whether they fulfil any office in the nutrition of plants, our almost entire ignorance of the chemical changes which take place in vegetable tissues, will not allow us to decide; and much less can we conjecture the mode in which the mysterious forces residing in the solar emanation are made to work, under the inscrutable guidance of the plant-vitality, in order to build up the molecules of these substances from the far more stable atoms of carbonic acid, water, and ammonia. Nevertheless, until some further light is thrown upon the nature of these metamorphoses, we cannot reasonably expect to attain the great desideratum of being able to form these substances, some of which are already becoming exceedingly scarce and costly, by metamorphoses of cheaper compounds. In Merck's collection, the following substances may be noticed as of particular interest, and not elsewhere described.

Digitaline is the crystalline substance upon which the medicinal effects of the "foxglove (*Digitalis purpurea*) depend. In its effects upon the human system, it resembles nicotine, the poisonous alkaloid of tobacco, acting upon the cerebro-spinal system and stilling the pulsations of the heart, but it is uncertain and unsafe in its action. It also resembles caffeine in producing wakefulness. Unlike nicotine and caffeine, however, it is not at all basic in its chemical relations and contains no nitrogen.

Filicine is an alkaloid substance found in the rhizoma of the "male shield fern" (*Nephrodium filix mas*). It is little known.

Inuline is a substance resembling starch, and of precisely the same composition, which is found in many plants. It was first discovered by Marquart in the root of "elecampane" (*Inula helenium*), from which its name is taken, but exists also in the roots of the "dahlia," *Helianthus tuberosus*, "dandelion," "chicory," and others of the Compositae. It differs from starch in forming a yellow, instead of a blue compound, with iodine. By boiling dilute acids, and even by boiling water, it is converted into starch sugar.

Iodoform is the compound corresponding in composition to *chloroform*, which contains iodine instead of chlorine. Instead, however, of being like the latter, a colorless transparent volatile liquid, it appears in the form of beautiful yellow crystals, of a pearly lustre, which possess a strong smell resembling that of saffron.

Theobromine is a crystalline principle discovered by Woskresensky in "chocolate nuts" (*Theobroma cacao*). It resembles caffeine in its taste, in being precipitated by tannic acid from its solution, and in containing an enormous quantity of nitrogen (42 per cent.), but is not in the least degree basic. It is yet doubtful, although probable, that the presence of this substance in chocolate contributes wholly or partially to the attractiveness of the latter as a beverage. (See *caffeine* in note to No. 1, Class 2.)

Cantharidine, the substance to which is due the blistering power of "cantharides," and other vesicating insects, was discovered by Robiquet. It is a beautiful crystalline substance, which contains no nitrogen, and has no alkaloid properties. It belongs, in fact, to the class of volatile oils. It is in the highest degree vesicatory, and even its vapor, at the ordinary temperature, produced inflammation of the eyes in Robiquet and one of his pupils. When swallowed, it is one of the most horrible poisons known.

Gentisine, gentianine, or *gentisic acid*, is a pale yellow crystalline substance extracted from the root of "gentian," an excessively bitter plant, used in medicine. Not being in the least degree bitter, however, gentisine is of course not the medicinal principle of the root. It is volatile without decomposition, and appears to possess slightly acid properties.

Chinic or *kinic acid* is a curious substance, existing in *Cinchona* barks in combination with quinine and cinchonine. When pure, it crystallizes in colorless prisms, has a strong acid taste, and appears to be one of the most powerful of the organic acids. When chinic acid is exposed to a high temperature, it is converted among other interesting collateral products, principally into another white crystalline substance called *hydrochinone*, and when the latter is exposed to an oxidizing agent, it is converted by the abstraction of hydrogen, into what is called *green hydrochinone*, one of the most magnificent compounds known to chemists. It forms thin long crystals, having a splendid green metallic lustre, like that of the wings of the humming bird.

Pyrogallic acid is a white crystalline substance which is produced from gallic acid by sublimation, with loss of carbonic acid. A solution of pyrogallic acid absorbs oxygen from the air with very great avidity, and a dark brown substance is formed which is insoluble in water and alcohol. A solution of impure pyrogallic acid, prepared in a certain way, is therefore made the basis of one of the *hair dyes* recently devised. It stains the skin, however, and does not dye so quickly as the dyes now so common, which are composed of two liquids, successively applied, and which are all based upon some *photographic* change.

Papaverine and *narceine* are two crystalline substances which exist in opium, the former having been discovered very recently by Merck, and the latter in 1832 by Pelletier. The juice of the poppy, from which opium is made, is a very curious mixture, no less than seven crystallizable substances having been found in it besides the above two, namely:—*morphine, narcotine, thebaine, codeine, pseudomorphine, meconine* and *meconic acid;* of the whole nine, however, three or four only have any medicinal effect, namely, morphine, the most important one of all, codeine, thebaine and papaverine (?); narcotine and narceine, notwithstanding their incorrect names, being not at all narcotic. Morphine has already been alluded to in another note. Papaverine, according to Merck, crystallizes in needles, is strongly basic, and is distinguished from all the other principles in opium by becoming dark blue when moistened with oil of vitriol. Narceine crystallizes in long, white, silky fibres, of a feebly bitter and slightly metallic taste. It contains nitrogen, but has no basic properties. Diluted acids dissolve it with a fine blue color, and iodine also forms with it a compound of a blue color, these two properties, occurring simultaneously, being sufficient to distinguish narceine from all known substances. Narcotine was the first known of all the crystalline principles of opium, having been discovered by Derosne in 1803, the year previous to the discovery of morphine by Sertuerner, and received its name on account of the erroneous supposition that it was the active principle of opium. It crystallizes in colorless tasteless prisms. It differs from morphine, in being soluble in ether, but insoluble in alkalies and acetic acid. It contains nitrogen, and is feebly basic. Narcotine has recently occupied attention as a substitute for quinine, and many cases of intermittents are said to have been treated with it with success. Thebaine, pseudomorphine and meconic acid are not exhibited by Merck. Codeine was discovered by Robiquet in 1832. It crystallizes in rectangular prisms and in rhombic octahedrons. It contains nitrogen, and is a strong base like morphine, its solution in water having a strong alkaline reaction upon test paper. It is destitute of taste, but its medicinal action seems to be similar to that of morphine. Meconine crystallizes in white, almost tasteless, hexagonal prisms. It was discovered by Couerbe, in 1830. It contains no nitrogen, and is not in the least degree basic. It is probably an inert substance, although this point is not yet certainly ascertained.

Bebeerine, or *bibirine*, the sulphate of which is here exhibited, is an alkaloid obtained from the bark of the "*bibiru*," or "greenheart tree" (*Nectandria rodiaei*), which grows in South America. Bebeerine is strongly basic, but neither its salts nor itself are crystallizable. In composition it is said to be identical with morphine, although its medicinal effects are rather those of quinine. The sulphate is recommended as a cheaper substitute for sulphate of quinine.

Ononine, is from *Ononis spinosa*.

Amygdaline is a substance crystallizing in pearly scales, which was found by Robiquet in "bitter almonds," the bitter taste of which is due to its presence. It does not occur in sweet almonds. It contains nitrogen, is not basic, and when taken into the stomach in a pure state, is not poisonous, although when taken in the form of bitter almonds, it is so to a high degree, producing the same symptoms as a dose of cyanohydric (prussic) acid. This apparently anomalous action is due to the presence in bitter almonds of a substance (which is also found in sweet almonds) called *emulsine*, or *synaptase*, the atoms of which appear to be in an exceedingly unstable state of equilibrium, so that it very easily enters into spontaneous decomposition, and while in this condition has the power of communicating to the atoms of amygdaline, after the fashion of a ferment, a tendency to break up into a number of other compounds, among which are the so-called "hydruret of benzoyle," and cyanohydric acid, both, but especially the latter, highly poisonous compounds. Thus, when bitter almonds are swallowed, this metamorphosis is produced, and the symptoms of poisoning produced are actually due to prussic acid. In the same way when bitter almonds are distilled with water, the highly poisonous so-called "essential oil of bitter almonds" is produced, which is essentially a mixture of prussic acid with hydruret of benzoyle.

Brucine is an alkaloid which always accompanies strychnine, wherever the latter is found. It has the same action upon the system as strychnine, but a very much larger dose is required to produce the same effects.

Cubebine is a crystalline substance obtained from "cubebs," which is asserted by good authority to be identical with the *piperine* of "pepper." (No. 2, Class 2.)

Jalapine, or *rhodeoretine*, is a resinous substance contained in the root of "jalap" (*Exogonium purga*). It possesses acid properties.

Asparagine takes its name from having been first found by its discoverers, Vauquelin and Robiquet, in "asparagus" shoots. It is now known, however, to exist in all kinds of potatoes, in liquorice, and marsh mallow, and other roots, and in the extract of belladonna. It crystallizes in very fine large transparent prisms and octahedrons, has little or no taste, is perfectly neutral, and does not appear to have any appreciable medicinal action.

Atropine was discovered in 1819, by Brandes. It is the active principle of the "deadly night-shade" or *Atropa belladonna*, and crystallizes from its alcoholic solution partially in very light white masses of acicular crystals, like sulpbate of quinine; it is inodorous when pure, but has an extraordinarily bitter and unpleasant taste, with a very sharp metallic aftertaste. When applied to the eye, it destroys the contractility of the iris, causing the pupil to dilate, and to remain dilated for some time. This effect is produced by an excessively minute quantity of the alkaloid. It produces very violent and singular effects upon the nervous system when taken internally, among which is a sort of delirium, often accompanied by agreeable or amusing phantasms, sometimes amounting to actual frenzy, and sometimes even ending in death.

Peucedanine is from the root of *Peucedanum officinale*, and was discovered by Schlatter.

Phloridzine is a yellowish white crystalline substance, which was discovered by Könineck in the bark of the roots of the apple, pear, cherry, plum, and other fruit trees. It appears to form definite compounds with bases. When phloridzine is exposed to the action of acids for a long time, it decomposes into *sugar* and a new compound called *phloretine*, which also possesses a *sweet taste*.

Salicine (from *Salix*) the crystalline bitter principle of willow bark, was discovered in 1825 by Fontana, and has been made by the illustrious Piria the basis of a series of investigations, which, in ingenuity of contrivance and in brilliant and unexpected results have seldom, if ever, been surpassed by any others upon record. But it is impossible to do more than allude to these results here. Salicine crystallizes in microscopic white crystals, possesses a very bitter taste, and has an action upon the system similar to, though much less powerful than sulphate of quinine, for which it is sometimes substituted in the treatment of intermittents. In passing through the system, salicine undergoes the oxidation which every oxidable substance undergoes under the same circumstances, and becomes converted into a substance identical with that which gives the sweet smell to the flowers of the *Spiraea ulmaria* (meadow sweet), and the urine of a person who has taken salicine will be found to be strongly scented with meadow sweet.]

93.—Gehe & Co., *Dresden, Saxony.*—Proprietors.

A very large collection of chemical and pharmaceutical substances, among which are the following:—

A.—Drugs.

Verdigris; alums of various kinds; ambergris; Anacardia orientales; mispickel, from Freiberg and from Munzig, with arsenious acid and sulphide of arsenic manufactured therefrom; native orpiment; berries of acacia, elder, juniper and others; bdellium, bismuth, boracic acid, cadmium, smaltine from Schneeberg; barks of pomegranate, horsechestnut, walnut, mezereon, and others; gum damarum, gum euphorbium.

Flowers of arnica, orange, chamomile, pomegranate, lavender, mallow, melilotus, primrose, poppy, elder, nettle, mullein, violet, and others.

Fucus amylaceus, which forms the food of the bird which makes the Chinese edible bird's-nests; galbanum, gelatine, coccus ilicis, gamboge, ivy.

Leaves of orange, walnut, holly, cherry-laurel, yew, wormwood, aconite, arnica, belladonna, marigold, Indian hemp, centaury, maidenhair, marshmallow, toad-flax, Venus' hair, Mexican wormseed, hemlock, foxglove, fumitory, hedge hyssop, henbane, St. John's wort, hyssop, wild lettuce, club moss, marjoram, mallows, horehound, melilot, origanum, patchouly, balm, spearmint, peppermint, lungwort, pipsissewa, poison oak, rosemary, rue, savine, sage, scabiose, hartstongue, serpyllus, stramonium, tansy, thyme, nettle, uva ursi, and speedwell.

Jujube berries; Illyrian carbonate of potash, a very pure variety of crude potash; refined saltpetre, kino, kousso brayera anthelmintica, bleached shellac, bezoar stones, calamine, hematite, artificial pumice-stone, emery, Iceland moss, juniper wood, refined litharge, lithia mica, black oxide of manganese, mastic; musk bags, two varieties, Tonquin and Cabardine; silk from the muscular portion of the pinna nobilis, a shellfish, used in the South of Europe for making gloves; pieces of Egyptian mummy, gum myrrh, *nihil album*, or white oxide of zinc, made by burning zinc; metallic nickel, nux vomica.

Essential oils of fir, absynthe, bitter almonds, dill, angelica, anise, arnica (crystallizable), sweet oranges, bitter oranges, and Portugal oranges, bergamot, cajeput (white and green), calamus, cardamoms, caraway, cloves, cedrat, chamomile, several varieties; coriander, cumin, dracunculus, orange flowers, fennel, hyssop, jasmine, juniper berries and juniper wood, laurel, cherry laurel, lavender, limes, mace, sweet marjoram (French and German), balm, East India balm, millefleurs, milfoil, origanum, parsley, rosemary, roses, rose geranium, rue, savine, French and German sage, serpyllus, mustard, spike, tansy, white and red thyme, valerian, and grapes.

Expressed oils of bitter almonds, cocoa, laurel, and eggs; fixed oil, impregnated with odors of cassia, heliotrope, millefleurs, orange flowers, resède, tuberose, and violet, for use in perfumery; white and yellow petroleum, coal naphtha, olibanum, opoponax.

Palladium, native platinum from Siberia, platinum wire and foil.

Alcoholic powders of charcoal, colocynth, Peruvian bark, euphorbium, gum arabic, aconite, belladonna, hemlock, foxglove, henbane, wild lettuce, pulsatilla, savine, stramonium, sandal wood, nux vomica, mallow root, roots of calamus, elecampane, male fern, white hellebore, jalap, ipecacuanha, iris, and liquorice.

Powdered root of Pyrethrum caucasicum, or Persian pellitory, used in Europe to kill and drive away insects; alcoholic powders of rhubarb root, salep, ergot, worm seed, fennel seed, foenugreek seed, and linseed.

Roots of aconite, alkanet, marshmallow, angelica, aristolochia, arnica, arum, wormwood, asarum, bardana, belladonna, bistort, bryony, calamus, caryophyllata, chicory, colchicum, dictamus albus, elecampane, male fern, fennel, white and red gentian, white and black hellebore, hermodactyls, masterwort, Iris Florentina, Russian liquorice, German liquorice, mechoacan, peony, pimpinella alba, senecka, polypodium, German and Roman pellitory, Muscovite and Austrian rhubarb, Levantine and German salep, saponaria for washing lamb's wool, Brazilian sarsaparilla, squills, scorzonera, Solomon's seal, sumbul, dandelion, tormentilla, English valerian, valerian from Thuringia and from Millischauerberg near Lobositz in Bohemia grown on volcanic soil. Resin of guiacum, crystallized sugar of milk, sagapenum, sandarac, dragon's blood, Aleppo and Smyrna scammony, ergot.

Seeds of abelmoschus, dill, angelica, German, Russian, and Pugliese anise, canary, hemp, caraway, colchicum, coriander, cumin, Russian and German quinces, white English mustard, fennel, foenugreek, henbane, rycopodium, cucumber, nigella, peony, white and blue poppy, parsley, water hemlock, Dutch mustard, stavesacre, stramonium, and nettle.

Indian bean, cowhage, sponges, tinfoil of different colors, stearine, crude sulphide of antimony, stipites dulcamaræ, strontianite from Westphalia; storax, in cakes and liquid; amber, in various forms; Tacamahaca, Venetian talc, crude tartar, pure cream of tartar, Venice turpentine, tragacanth; Turiones Pinghar Yambi, the product of a kind of palm, a new anti-inflammatory remedy; Alexandrian tutty; pitchblende from Johann Georgenstadt; antimonial glass, wolfram, genuine civet.

Colors and dye stuffs: dried albumen, from blood and from eggs; Berlin and Paris blues, bronze powders, red colcothar, chrome red, vermilion, cinnabar from Japan; black Italian chalk, Cremnitz white, Schweinfurt green, German red lead, cudbear, picric acid, powdered graphite; true sepia, from the Adriatic, in the bag; terra di Sienna, tripoli; ultramarine, four varieties, made from lapis-lazuli, at the Royal Porcelain Factory in Meissen; umber, zinc white.

B.—Commercial and pure Chemical and Pharmaceutical Preparations, from the most noted manufacturers of Germany, and especially of Saxony, comprising, with many others, the following:—

Pure acetone, glacial acetic acid, pure benzoic, boracic, butyric, chloric, chromic, chinic, chinovic, citric, formic, gallic, cyanohydric or prussic, fluosilicohydric, perchloric, hippuric, iodic, lactic, malic, meconic, molybdic, mucic, oxalic, phosphoric (glacial), nitropicric, pyrogallic, succinic, tannic, tartaric, uric, uvic, tungstic, and valeric acids.

Aconitine, æsculine, pure absolute alcohol, alloxan, pure alumina and its sulphate; pure ammonia salts, bichromate, carbonate, iodohydrate, chlorohydrate, molybdate nitrate, oxalate, phosphate, succinate, sulphate, sulphite and urate of ammonia; ammonio-sulphate of copper, phosphate of soda and ammonia, tartrate of potash and ammonia, amygdaline, butyrate and acetate of oxide of amyle, anemonine, iodide of arsenic, asarone, asparagine, atropine; antimony compounds, suboxide, pure teroxide, terchloride, red precipitated tersulphide, black native tersulphide and golden pentasulphide of antimony, pure tartar-emetic or tartrate of potash and antimony.

Barium compounds: pure acetate, carbonate, chlorate, hyposulphate, crystallized hydrate and nitrate of baryta, chloride and iodide of barium; pure bebeerine, berberine, benzole; metallic bismuth and precipitated nitrate, valerate and hydrated oxide of bismuth; bromine, bromoform; pure brucine, and its pure sulphate.

Carbonate and sulphide of cadmium, chloride and sulphide of calcium, and sulphantimoniate of sulphide of calcium; cantharidine; capsules of various kinds filled with different substances, such as balsam copaiva, castor oil, oil of cubebs, oil of turpentine, cod-liver oil, assafœtida, tar, croton oil, etc.; perchloride of carbon, cardole, carvacrole, chelidonine, chloric ether, chloroform, oxide of chromium, chrome alum, oxalate of oxide of chromium and potash, chlorohydrate of cinchonine.

Metallic cobalt, pure; carbonate, nitrate, oxalate, oxide and chloride of cobalt, codeine, pure; colocynthine; columbine, crystallized; pure caffeine and its citrate, collodion, conine, cubebine; copper compounds, pure acetate, carbonate, sulphate, chloride, protoxide and suboxide of copper; daturine, digitaline, delphinine.

Elaterium, white and black; pure emetine, ergotine; essences (French, alcoholic) for perfumery, of bouquet, heliotrope, hyacinth, jasmine, jonquil, *miel d'Angleterre*, *millefleurs*, *mousseline*, orange-flowers, mignonette, rose, violet, and cucumbers.

Ethers: pure sulphuric, acetic, formic, iodohydric, œnanthic, oxalic and methylic, pineapple, apple, pear, strawberry, mulberry, and peach ethers; also, butter, sugar, rum, and cognac ethers, used in the preparation of artificial rum and brandy.

Dry powdered medicinal extracts of aconite, belladonna, hemlock, foxglove, henbane, and wild lettuce; filicine; fusel oil; crystallized gentisine; glycerine; glycirrhizine; gold, crystallized chloride and solution of the same; chloride of gold and sodium; graphite; hematoxyline; jalapine; indigotine; inuline; iodoform.

Iron compounds; yellow and red prussiates of potash; yellow prussiate of soda; ferrocyanides of barium and potassium; tartrate of iron and potash; oxalate of iron and soda; cyanide, iodide, red oxide, crystallized sesquichloride, sublimed sesquichloride and sulphide of iron, with citrate, carbonate, lactate, oxalate, phosphate, pure sulphate, tannate and valerate of iron; creosote; lactucarium; lupuline; chloride of lithium; carbonate and sulphate of lithia; magnesia with citrate, chlorohydrate, nitrate, tartrate and valerate of magnesia; pure sulphate, carbonate and crystallized chloride of manganese; mannite; meconine; menispermine; morphine, pure and crystallized, with acetate, chlorohydrate and sulphate of morphine.

Mercury compounds; white precipitate; acetate, nitrate, phosphates and sulphates of suboxide and protoxide, bromide and subbromide, cyanide, subiodide and red protiodide, protochloride, sublimed and precipitated subchloride, red oxide, black suboxide and black sulphide of mercury; sulphantimoniate of sulphide of mercury.

Naphthaline; narcotine; nitrate, oxalate and oxide of nickel; nicotine; ononine: oxyacanthine; chloride of palladium in solution; papaverine; peucedanine; phloridzine; amorphous red phosphorus; picrotoxine; piperine; platinum sponge with chloride and ammoniochloride of platinum.

Potassium, metallic, with bromide, chloride, pure and commercial cyanide, iodide, fluoride and pure sulphide of potassium; acetate, bicarbonate, bichromate, bisulphate, pure carbonate, citrate, chromate, pure and commercial chlorates, deutoxalate, commercial and pure alcoholic hydrates, manganate, nitropicrate, pure oxalate, perchlorate, pure phosphate, antimoniate, basic soluble silicate, crystallized bitartrate, valerate, rhodanate and fluosilicohydrate of potash.

Quassine; quinidine, pure; acetate, arseniate, citrate, chlorohydrate, neutral sulphate, disulphate, and valerate of quinine; quinoidine; rhabarbarine; salicine; sanguinarine; santonine; soap powder; selenium; pure silica; solanine, crystallized.

Silver compounds; pure chloride, cyanide and iodide, acetate, carbonate, crystallized and fused nitrate, and sulphate of silver; metallic sodium, and pure bromide, acetate, bicarbonate, chlorate, chloride, choleate, formiate, hydrate, hyposulphate, hyposulphite, iodate, iodide, molybdate, nitrate, oxalate, phosphate, pyrophosphate, succinate, sulphite and valerate of soda.

Strychnine, pure, with acetate, nitrate and sulphate of strychnine; hydrate, chlorohydrate, carbonate and nitrate of strontia; precipitated sulphur; iodide of sulphur: theobromine; protochloride, deutochloride and deutoxide of tin; oxide of uranium; crystallized pure urea and crystallized pure nitrate of urea; pure white veratrine; crystallized xylosteine.

Pure metallic zinc and its compounds; acetate, pure carbonate, cyanide, ferrocyanide, pure chloride, lactate, pure and commercial oxide, pure and commercial sulphate and valerate of zinc.

C.—Apparatus for the use of chemists and apothecaries.

Apparatus for impregnation of water with carbonic acid gas on a small scale, various sizes, made of earthenware and porcelain, together with the materials for generating the gas put up in packages containing weighed quantities.

Pharmaceutical apparatus from the Royal porcelain factory at Meissen, comprising mortars and pestles, evaporating dishes, dippers, crucibles, funnels of various kinds, spatulas, retorts plain and tubulated, matrasses, sulphuric acid dishes for drying under bell glass, dishes and tubes for furnace operations, measures and other articles.

Pharmaceutical Apparatus from Elgersburg, Fayence, comprising evaporating basins of various forms and sizes, graduated measures of several sizes, porcelain jars for containing powders, with ground stoppers, jars of various forms and for various purposes,

water baths, crucibles, funnels, spatulas, mortars and pestles, retorts and various other articles.

Chemical apparatus, among which are evaporating dishes, Luhme's lamps, bottles with stoppers, composed of opaque white glass. Berzelius lamps, mortars, spatulas, specific gravity bottle, holding 100 grains of water with weights, sets of grain weights, brass and platinum, various kinds of stoppered bottles with labels melted into the glass, beakers, funnels, gas generators with safety tubes, Liebig's condensers of different sizes, Whitstock's areometer, two-necked bottles, florentine receiver, funnel with glass stopcock, Robiquet's displacement apparatus, moulds for nitrate of silver, pill machines, fine sieves of various kinds, Descroizilles' alkalimeter, alcohometer with thermometer and appurtenances, sets of cork borers, labels, reagent chests of different sizes, retort holders, filter-stands, Woulfe's bottles, matrasses, retorts, etc.

A large assortment of bottles, jars, etc., for apothecaries, composed of glass, transparent and hyaloid, and porcelain, with stoppers and labels of different patterns, for holding liquors, powders, etc.

Numerous articles made of serpentine rock, by turning, carving, etc., such as mortars, pestles, tea-jars, pomade-pots, salt-cellars, paper weights, etc.

A large assortment of scales and weights of various forms, for the use of apothecaries, gold and silver refiners, assayers, etc. Pill machines. Trusses of different kinds. Iron spatulas; agate mortars; horn spoons and spatulas. Specimens of amber beads and necklaces. Many varieties of pill boxes and paper boxes for other purposes, together with an extensive assortment of colored, glazed, marbled and other ornamental papers.

94.—Herman O., *Schoenebeck, Prussia.*—Manufacturer. (Agents, Haskell, Merrick and Bull, *No.* 10 *Gold Street, New York.*)

CHEMICAL PREPARATIONS.

Potassium and its cyanide; hydrate, carbonate, and red prussiate of potash; sodium; hyposulphite of soda; metallic cadmium; glacial phosphoric acid; gallic and succinic acids; iron alum; precipitated subnitrate of bismuth; nitrate of baryta; dry nitrate of strontia; oxide of zinc.

[*Potassium* and *sodium* are two metallic substances, the first of which exists in potash and the last in soda. Potash is the oxide of potassium and soda is the oxide of sodium. These two metals possess a brilliant metallic lustre, a lead gray color, are as soft as wax, so that a mass of either of them may be flattened between the fingers; are lighter than water, and will float upon it. They both melt below the boiling point of water, and an alloy of the two is fluid, like mercury, at the ordinary temperature, and even as low as the freezing point. They are both converted into vapor, at a red heat, and the vapor of potassium is of a splendid green color. These two metals were discovered by Sir Humphrey Davy, in 1807. They are prepared by the distillation of potash or soda, or compounds of these alkalies, with carbon, at a very high heat. They have such an intense affinity for oxygen, that, when exposed to the air, they are very quickly reconverted into potash and soda, and when thrown upon water, decompose it, with the production of so much heat that they immediately catch fire, and burn with flame: this flame, in the case of sodium, being of a pure deep yellow, and in the case of potassium, of a violet color.

On account of this easy oxidability, it is necessary, for the purpose of preserving them, to keep them under the surface of some liquid which contains no oxygen, and the best and cheapest liquid for this purpose, is *benzole.* (See note to No. 7, Class 2.)

The metal, sodium, which is much more easily obtained than potassium, will yet be employed for some purpose in the arts, there being no difficulty in making it on a large scale, quite cheaply enough.

Cadmium is a metal which very much resembles zinc, in its chemical relations, and consequently very frequently occurs in company with the latter, in mineral substances, especially in *blende.* It is a beautiful tin-white metal, harder than tin, and very ductile and malleable It melts at a red heat, and evaporates very fast. The only native compound of cadmium is the sulphide, or the mineral *Greenockite.* Sulphide of cadmium, prepared artificially, is now used by artists, as a yellow paint, being the finest and most permanent of all the yellow pigments in use. It is known in commerce by the name of "cadmium yellow."

Hyposulphite of soda is a compound of soda with hyposulphurous acid, which latter is one of the numerous acids formed by sulphur, in combination with oxygen, and contains precisely three times the proportion of sulphur that exists in sulphuric acid. Hyposulphite of soda has the property of dissolving the compounds of silver, and is used to a considerable extent in photography, for the purpose of dissolving off the coating of the sensitive silver compound from the paper or Daguerreotype plate, after the formation of the picture, thus "fixing" the picture, as it is called, or rendering the plate no longer sensitive to light. The picture itself being composed, in the Talbotype, of reduced metallic silver, and in the Daguerreotype, of a thin film of metallic mercury, is not in the smallest degree soluble in the solution of hyposulphite of soda, and remains, therefore, wholly unaffected.]

95.—Town Authorities of Reichenstein, *Silesia.*

Samples of arsenious acid, in powder and in the vitreous form; orpiment.

The ore of the arsenic mine "Reicher Trost," in Silesia, is a deposit of mispickel in a mica-slate formation, forming a bed of the thickness of five or six fathoms, the gangue in which it occurs being composed of limestone, serpentine and different talcose minerals. In this bed, especially in the serpentine, the ore appears in masses more or less compact, and sometimes finely disseminated. The dressed ores contain from seventy to seventy-five per cent. of arsenic in the form of *arsenious acid.* The ore, after being stamped, is roasted in a reverberatory furnace, by which means the arsenic is oxidized, and the arsenious acid thus obtained is conducted, in the state of vapor, into an apartment called the "poison-chamber," where it condenses into a white powder. This is the *crude* arsenious acid, and to obtain from it the other commercial forms in which arsenic is found, it is melted in iron kettles, which gives the so-called *vitreous* arsenious acid, and the vapors which are given off during the melting are condensed, and form the common "white arsenic." The residue after the roasting of the ore left in the furnace is principally oxide of iron, with salts of arsenious acid, and contains also a little *gold,* which is now extracted, profitably, by the process of Plattner.

For the production of orpiment, rolls of brimstone are thrown into the kettles, during the process of refining. The products of the Arsenic Works, at Reichenstein, from 1380 to 1845, inclusive, were as follows:

Vitreous arsenious acid, ...	19,940 cwts.
Orpiment, ...	2,761½ "
Refined arsenious acid, ...	526½ "
Crude arsenious acid, ...	32,058 "

96.—Marquart, Dr. L. C., *Bonn, Prussia.*—Manufacturer.

Nitrate and chlorate of baryta; nitrate of strontia; hyposulphate of soda; bisulphide of carbon; uranic acid; acetic ether; crystallizable acetic acid; acetate of oxide of amyle; valerate of *ditto;* bromine; nitrobenzole; solutions of caoutchouc and gutta-percha in bisulphide of carbon.

[*Bisulphide of carbon* is a very curious compound, and one of the only three known examples of the combination of two solid elementary substances to form a liquid. It is, when pure, a transparent colorless liquid like water, very volatile, and possessing an odor disagreeable beyond all description. It is used, notwithstanding its horrible odor, in the beautiful modern art of silver-plating by voltaic electricity, having the curious property of causing the metal to precipitate with a bright metallic surface, when added in very small quantity to the silver-solution. Bisulphide of carbon has also the power of dissolving caoutchouc and gutta-percha, forming with them transparent varnishes, specimens of which are here exhibited. By chemists, it is sometimes called *sulphocarbonic acid,* being the sulphur-acid corresponding to carbonic acid, and forming regular series of sulphur-salts with alkaline sulphides.

Uranic acid is the oxide of a metal contained in *pitchblende,* and some other minerals, called by Klaproth, who discovered it, in 1789, *uranium.* It is used principally for the purpose of coloring glass, to which it communicates a very much admired greenish-yellow opalescent tint, and is now manufactured for this use on a large scale, in Europe. The compounds of uranic acid with the alkalies and other bases, are all insoluble, possess beautiful yellow colors, and will probably, at some future time, come into use as pigments, for which their perfect unchangeability in the air highly qualifies them.

Acetic ether is a substance which occurs naturally in many wines as a product of fermentation, and may be found in the brandy distilled from these wines. It is obtained artificially by distilling together some acetate, such as acetate of potash, soda, or lime, sugar of lead, or verdigris, with alcohol and sulphuric acid, and purifying the product. When pure, it is a colorless, transparent liquid, of a very pleasant aromatic smell. It has been proposed as an anæsthetic agent instead of common ether, and is used for flavoring liquors, wines, &c. It is also used to some extent in Germany, as a medicinal agent, having diaphoretic properties.

Crystallizable acetic acid is acetic acid entirely freed from all admixture of water, and is so called because a little below the ordinary temperature (at 55° Fahr.), it freezes into a solid crystalline mass. Acetic acid, as the name indicates, is the acid of vinegar, in which it occurs, however, in a very much diluted state. The crystallizable acetic acid has a very strong, penetrating smell, and an excessively pungent acid taste. When applied to the skin, it immediately produces redness and blisters, and when swallowed, acts as a powerful corrosive poison, like oil of vitriol. The universal use of vinegar, as a condiment, is, therefore, a remarkable example of the difference which exists between the actions of most substances upon the human stomach, in the concentrated and diluted forms, of which difference *alcohol* is another instance. It is, nevertheless, the very property by reason of which concentrated acetic acid corrodes the tissues of the stomach, which gives to vinegar its power of assisting digestion, and, therefore, its virtue as a condiment, namely, the power possessed by acetic acid of dissolving fibrine and albumen.

The *acetate* and *valerate of amyle,* here exhibited, are two ethers which are, on one account, peculiarly interesting. Although when pure, these two ethers have odors and tastes which are rather penetrating than agreeable, yet, when diluted largely with alcohol, odors are developed in the highest degree aromatic and fruity, and forming the most perfect resemblance, in the first one, to that of pears, and, in the last one, to that of apples. The recent discovery of these facts has created a considerable demand in commerce for these ethers, for the purpose of imitating the flavors of these fruits, and they are now consequently manufactured in quantities.

Nitrobenzole is another preparation which is also interesting for precisely the same reason as the above two ethers. It was observed by Mitscherlich, who discovered it about twenty years ago, to have the most perfect resemblance, in smell and taste, to the volatile oil of bitter almonds (see note to *amygdaline,* No. 92, Class 2), although *wholly different* in composition. It was not, however, till very recently that this substance has been proposed, and introduced into commerce, as a substitute for the poisonous and dangerous oil of bitter almonds. Nitrobenzole is made by the action of nitric acid upon benzole (see note to No. 7, Class 2), and is manufactured in England to a considerable extent. It has a smell which is not perfectly identical with that of oil of bitter almonds, but so closely similar as to be very easily mistaken for it. It is used for flavoring soaps, and confectionary, and is supposed to be not at all poisonous.]

97. Wissenbach, Carl, *Frankfort-on-the-Maine,*—Manufacturer. (Agent, A. Seifert, 32 *Maiden lane, New York*).

Genuine cognac oil (œnanthic ether) and oil of juniper.

[*Oenanthic ether* is the name given to the substance to which the *smell*, and a great part of the *taste*, of many *wines*, are due, and which, being volatile, is of course distilled over in the manufacture of brandy from such wines, and contributes largely to the flavor of the latter beverage. It was found by Liebig and Pelouze to be composed of a peculiar fatty acid, called *oenanthic acid*, combined with common ether or the oxide of ethyle. It has also been stated by Wöhler to be identical with the substance which gives the odor to the rind of the quince (*Cydonia vulgaris*), but a more recent investigation by another chemist has thrown some doubt upon this result. Oenanthic ether, when pure, has a strong odor of Rhenish wine, which odor has a powerful and even in some cases, a dangerous effect upon the nervous system.]

98.—Mining Works *at Bodenmais, Bavaria.*
Sulphate of copper and other products.

99.—Lennig, Dr. Clemm, *Wohlgelegen, Bavaria.*—Manufacturer.
Refined sulphur in the form of rolls and busts.

100.—Saltworks at Berchtesgaden, *Bavaria.*
Samples of salt.

101.—Trepte & Fereo, *Leipsic, Saxony.*—Manufacturers.
Essences and essential oils for the manufacture of liquors, &c. Oils of valerian root, juniper, fennel, coriander, chamomile, caraway, calamus, angelica and wormwood leaves; essence of Jamaica ginger; essence for Jamaica rum; oil of Swiss herbs; oil of tansy; oil for Spanish bitters; oil of bitter herbs; oils of dill and marjoram; oils for *goldwasser*, maraschino and "railway liquor."

102.—Spahn & Schimmel, *Leipsic, Saxony*—Manufacturers.
Essential oils and other preparations for the manufacture of liquors. Oils of valerian root, caraway, fennel, Roman chamomile, calamus, and coriander seed; essences for the manufacture of cognac and Jamaica rum.

103.—Kaimmelbein & Baedt, *Barmen, Prussia.*
Chemical preparations for dyers and calico-printers.
Red prussiate of potash; nitrate of ammonia; perchloride of tin; solution of cochineal in ammonia; prepared catechu; sal ammoniac; stannate of soda; pink salt; picric acid; cyanide of potassium in powder; orseille or archil and extract of the same; cudbear; composition for royal blue; safflower carmine.
[Red *prussiate of potash* (ferrocyanide of potassium), so called to distinguish it from the *yellow prussiate of potash* (see note to No. 36, Class 2.), is formed by the action of oxidizing agents upon the yellow prussiate. It crystallizes in large deep red prisms, which, among other peculiarities, are remarkable for their property of emitting a *ringing metallic sound* when struck. In dyeing, it is used for the production of a variety of *Prussian blue*, which is formed when it comes into contact with a salt of protoxide of iron.
Bichloride of tin is a very curious substance, being the only compound of chlorine with any one of the *common* metals (except arsenic), which is fluid at ordinary temperatures. It is a colorless transparent thin liquid, which does not freeze at 52° Fahr. below the freezing point of water, and boils at 248° Fahr. When exposed to the air it gives off white fumes, which are due to the formation of a solid compound between its vapor and the moisture of the atmosphere. Its solution in water is employed by dyers as a source of the *deutoxide of tin*, or *stannic acid*, used by them as a mordant. *Stannate of soda*, also here exhibited, is used by them as another source of the same material. The coloring matter of cochineal, called properly *carmeine*, though usually "carmine," is soluble in water, when obtained in a free state, but the fatty matter contained in the insect prevents the action of water upon it. Dilute ammonia, however, readily dissolves it from the insect, owing to the combination of the ammonia with the fat, forming a solution which is used by the dyers.
Catechu is the inspissated extract of the wood of the *Acacia catechu*, a tree which grows in various parts of the East Indies and in Jamaica. It is used by dyers, not as a dyestuff, however, but as a source of *tannic acid*, which it contains in very large quantity, and which has the property of forming, with a solution of a salt of sesquioxide of iron, an exceedingly deep bluish black liquid (ink). Catechu is used also in medicine, as an astringent, on account of the large quantity of tannic acid which it contains.
Picric acid ("nitropicric acid," "indigo bitter," "chrysolepic acid") is a yellow crystalline substance prepared by the action of strong nitric acid upon indigo, or upon aloes. It possesses an intensely bitter taste, from which property its name is derived. Its salts are mostly insoluble in water and possess fine yellow colors, upon which two properties its recent use in dyeing is founded. These *picrates* have the extraordinary property when in a dry state of *exploding* when heated, with great violence.
Safflower is composed of the flowers of *Carthamus tinctorius*, an East Indian plant. Its coloring matter *carthameine*, called by these exhibitors "safflower carmine," is a resinoid substance of a very beautiful, but unfortunately not a very permanent red color, for when exposed to action of air and light, it slowly combines with oxygen with elimination of water and carbonic acid, and is converted into a yellow substance. The "pink saucers" sold in shops, for various purposes, contain carthameine, and mixed with talc, it forms the *rouge* used by females for painting their faces.]

104.—Kayser, L. & Co., *Neuwalden, Silesia.*—Manufacturers.
Mettallic nickel.

105.—Herbras, Witte & Co., *Iserlohn, Prussian Westphalia.*

NICKEL.

[The metallic element *nickel* was discovered in the middle of the last century by Cronstedt, a German chemist, and is used at the present day to a very large extent in the arts, being remarkable for the peculiar whiteness and silver-like lustre which it communicates to the other metals, when alloyed with them. The alloy called "German silver" owes its peculiarities to the nickel which it contains. Nickel in the proportion of only three per cent., alloyed with iron, communicates to the latter a greater whiteness, a less tendency to rust, and a capability of receiving a high silver-like polish, without in the least detracting from its toughness or malleability. The principal ore of nickel is the mineral called *copper nickel*, which is found at Schneeberg in Saxony, and several other places, and consists of a compound of *arsenic* with nickel.]

106.—Electoral Hesse Smalt Works, *Schwarzenfels.*—Manufacturers.
Forty-two samples of ultramarine and other colors; speiss nickel (nickel-glance) oxide of nickel and metallic nickel in cubes.

107.—Curtius, Julius, *Duisburg, Rhenish Prussia*—Manufacturer. (Agents Cyrus W. Field & Co., *Cliff street, New York*).
Four varieties of ultramarine.

108.—Gademann, Heinrich, *Schweinfurt, Bavaria.*—Manufacturers.
Ultramarine and other colors.

109.—Wolff & Co., *Schweinfurt, Bavaria.*—Manufacturer.
Twelve samples of ultramarine of different shades.

110.—Adam, J. N. *Rennweg near Nuremberg, Bavaria.*
Ultramarine and other colors; red prussiate of potash; crystallized mass of yellow prussiate of potash.

111.—Buchner, Wilhelm, *Pfungstadt near Darmstadt, Hesse-Darmstadt.*—Manufacturer.
Six samples of ultramarine.

112.—Breuninger & Son, *Kirchheim, Wurtemberg.*—Manufacturers.
Eighteen samples of ultramarine.

113.—Fries, C. A., *Heidelberg.*—Manufacturer.
Six samples of ultramarine.

114.—Widow of M. Kohnstamm, *Niederwerrn, Bavaria.*—Manufacturer.
Six samples of ultramarine.

115.—Siegle, Heinrich, *Stuttgardt, Wurtemberg.*—Manufacturer.
Carmine and other lakes.

116.—Horstmann & Co., *Horst, Rhenish Prussia.*—Manufacturer.
Samples of blue colors.

117.—Puscher, Brothers, *Nuremberg, Bavaria.*—Manufacturers.
One hundred and twenty different colors.

118.—Halbich, George H., *Cassel, Hesse.*—Manufacturer.
Twenty-four samples of blue colors.

119.—Dietel, Gustav, *Saxe-Weimar.*—Manufacturer.
Chremnitz white; white lead; sugar of lead; cudbear and archil.

120.—Voigt, C. W., *Neuwerk near Königsee.*—Manufacturer.
White lead, Paris blue and other blue colors.

121.—Loebbecke, C. S. & Co., *Breslau, Silesia.*—Manufacturers. (Agent, J. W. Schmidt, *Prussian Consul, 56 New street, New York.*)
Zinc white.

122.—Loewenberg, Dr. P., *Berlin.*—Manufacturer. (Agent, Mr. Cogswell, *Astor Library, Lafayette Place, New York.*)
Three varieties of Prussian blue, two of chrome yellow, verditer, white lead, chrome green, &c.

123.—Kieser, Carl A., *Langeweisen, Saxony.*—Manufacturer.
Forty-eight samples of different colors.

124.—Benda, George, *Fürth, near Nürnberg, Bavaria.*—Manufacturer.
Bronze powders and metallic leaf.

125.—Haenle, Leo, *Munich, Bavaria.*—Manufacturer.
One hundred and twenty samples of bronze powders.

126.—Geitner & Co., *Schneeberg, Saxony.*—Manufacturers.
German silver and colors for porcelain painting.

127.—Schlosser, J., *Ratingen, Rhenish Prussia.*—Manufacturer.
Black lead crucibles.

128.—Kapeller & Son, *Hafnerzell, near Passau, Bavaria.*—Manufacturers.
Black lead crucibles.

AUSTRIA.

129.—Batka, Wenzel, *Prague, Bohemia.*
Chemicals; selenium; molybdenum; nickel and cobalt, metallic; cadmium; wolfram, talc and other minerals. Various chemical and pharmaceutical apparatus. Models of crystals in glass.

130.—Von Herbert, Ignatz, *Klagenfurt, Carinthia.*—Manufacturer.
White lead; orange and bright red lead; red and gold litharge

131.—Setzer, J., *Weiteneck on the Danube.*—Manufacturer.
Ultramarine of various shades; cadmium yellow; red and rose madder.

132.—Petz, W. *Pesth, Hungary.*—Manufacturer.
Two samples of carmine.

133.—Kinzelberger & Co., *Prague, Bohemia.*—Manufacturers.
One hundred and eighty different colors.

134.—Hardmuth, L. & Co., *Budweiss, Bohemia.*—Manufacturers.
Naples yellow and artificial pumice stone.

ITALIAN STATES.

135.—Puccio, Antoine, *Genoa, Sardinia.*—Manufacturer.
Three samples of sulphate of quinine.

136.—Dufour, Lorenzo, *Genoa, Sardinia.*—Manufacturer.
Sulphate and citrate of quinine.

137.—Scola, Bernardino, *Turin, Sardinia.*—Inventor and Manufacturer.
Gelatine capsules, filled with copaiva balsam and cod liver oil; camphor cigarettos.

138.—Parola, Luigi, *Cuneo, Piedmont.*—Manufacturer.
Extract of ergot.

139.—Bonjean, C. J. *Chambery, Sardinia.*—Manufacturer.
Extract of ergot.

[*Ergot* (*Secole cornutum*), is the product of a morbid development of the seed of the *rye*, and of some other gramineous plants, produced by the growth upon them of a microscopic fungus (*Oidium abortifaciens*, Quekett; *Hymenula clavus*, Corda). It has been in use for a great many years as an agent for accelerating parturition, both in human beings and in animals. When administered to males, except in very large doses, it produces no obvious effects, but if to females, it causes violent and constant contractions of the uterus, which tend to expel the *fœtus*. The continued use of ergot, as, for instance, the use of bread made from rye contaminated with it, produces a morbid condition, known by the name of *ergotism*, which sometimes has assumed an epidemic form, especially in certain parts of France, where rye bread is much used for food. Its symptoms are contractions of the muscles of the extremities, sensations as if insects were crawling over the skin, and other disorders of the nervous system, followed in some cases by convulsions, in others by gangrene of the extremities, and ending in death. Ergot has been found by Wiggers to contain a resinoid, uncrystallizable substance which he denominated *ergotine*, and which he considered to be its active principle, but this is exceedingly doubtful. The extract prepared by this exhibitor possesses the properties of ergot, and is an exceedingly convenient form for the preservation and administration of this valuable medicine.]

140.—De Larderel, Count, *Tuscany.*—Inventor and Manufacturer.

BORACIC ACID.

[This is an acid contained in the common substance called *borax*, which is so much used as a flux for metals. Borax is the *biborate of soda;* it was originally brought from a lake in Thibet, which contains in solution in its waters, both borax and common salt. Now, however, nearly all the borax and boracic acid of commerce are made by this exhibitor, by collecting and condensing the vapors which rise from the lagoons of Tuscany, which vapors contain both boracic acid and sulphohydric acid gas. Boracic acid is one of those substances which, like phosphoric acid, is volatilized only at a very high temperature when anhydrous, but whose relations to water and heat are such, that when in solution, it volatilizes, in company with the vapor of water, at a temperature below the boiling point of the latter. Hence its occurrence in the vapors of these Tuscan boiling springs. Its origin, together with that of the accompanying sulphohydric acid, has been ingeniously explained by Dumas, by supposing the existence at some point in the earth's crust near this locality, of a deposit of the *sulphide of boron*, which, upon contact with water, would form both boracic and sulphohydric acids, with the evolution of a great deal of heat, which would account for the immense quantity of steam accompanying these products. Boracic acid was early discovered in the steam which issues from these lagoons. M. De Larderel in 1818 first attempted to utilize it for industrial purposes. Obtaining a grant of that wild and desolate region of the Tuscan maremma, where the soil was reeking with volcanic heat and vapors, he has converted it into a busy and fruitful district, with immense advantages to the Tuscan people, amassing at the same time an ample fortune. His happiest conception was in turning the hot vapors and subterranean heat into channels under his evaporating pans with an absolute saving of all expense for fuel. The water impregnated by the boracic acid is led down from one cauldron to another until it has acquired sufficent concentration to crystallize. The crude product is again and again recrystallized until it is sufficiently pure for commerce, and is then shipped for market to be made into borax, chiefly in Paris. A large demand for borax has of late years grown out of its use in the arts of glass making and pottery. It is used in the latter art as a glazing in place of lead.

The Count de Larderel has established his works at nine principal places, namely: at Monte Cerboli, Castel Nuovo, Sasso (from this place boracic acid has long since derived its mineralogical name of Sassolin), Monte Rotondo, St. Frédéric, St. Édouard, Lago, Lustignano, and Serraggano. At all these he has erected works, on an extensive scale, turning out a vast annual product for the supply of European manufactures and commerce.

Boracic acid is also found at the Lipari Islands in the crater of a volcano. Native borax (borate of soda) is found in considerable abundance in Thibet, where it occurs crystallized and also dissolved in the waters of a lake. It is called by the East Indians "Tincal."

It is also found in a state of combination in several minerals, such as hayesine, boracite, hydroboracite, tourmaline, datholite, danburite, &c. Boracic acid has very feeble acid properties, and indeed, appears sometimes to take the part of a base.]

141.—Sclopis, Brothers, *Turin, Sardinia.*—Manufacturers.
Chemical products, including muriatic, nitric, and sulphuric acids, phosphorus, sulphur, sulphates of magnesia, copper and iron, &c.

142.—Albani, Brothers, *Turin, Sardinia.*—Manufacturers.
Chemical productions, including nitric and sulphuric acids, phosphorus, matches, nitrate of baryta, glue, soap, soda, &c.

143.—Bo, Augusto, *Turin, Sardinia.*—Manufacturer.
Chrome yellow; white lead; Prussian blue, &c.

SWITZERLAND.

144.—Lauterburg, Frederic, 16 *Rue de l'Arsenal, Berne.*—Manufacturer.
Samples of a mineral water-proof composition for linen, pasteboard, &c., with samples illustrating its application to cloth, thread, ropes, &c.

BELGIUM.

145.—Kapellemans, Deay & Co., *Brussels.*—Manufacturers.
Chemical preparations, including sulphate of zinc, sulphates of copper, iron, magnesia, soda, &c.

146.—Brasseur, Eugene, *Ghent.*
Five samples of ultramarine and five samples of white lead.

147.——— ———.
Oxide of zinc.

HOLLAND.

148.—Van Enst & Dyk, *Amsterdam.*—Manufacturers.
Crystallized borax.

149.—Jorraetsma, A., *Dokkum, Netherlands.*—Manufacturer.
Veterinary medicines.

150.—Voule, W. & Co. *Amsterdam.*—Manufacturers.
Samples of indigo, Dutch madder and garancine.

151.—Nooatveen & Co., *Leyden.*—Manufacturers.
Colors and varnishes.

152.—Suringea & Sons, *Groningen.*—Manufacturers.
Friesland green and other colors.

153.—Enthoven, J. L, & Co.,—Manufacturers.
Specimens of zinc-white and zinc-yellow.

154.—Beekhuis, Damste & Co., *Groningen, Netherlands.*—Manufacturers.
White lead.

SWEDEN.

155.—Hjerta & Michaelson, *Stockholm.*—Manufacturers.
Chemically pure concentrated sulphuric acid, and potash soap.

156.—Klefva Mine.
Metallic nickel.

SPANISH COLONIES.

157.—Sauto, Dr. Ambrosio, C., 13 *Middle St., Matanzas. Cuba.*
Sarsaparilla. Fifty-samples of chemical preparations among which are sulphate, citrate, and valerate of quinine; strychnine; morphine; piperine; deutiodide of mercury; white precipitate; nitrates of iron, bismuth and silver; iodide of lead, &c.

158.—Henna, Joseph, *Ponce, Porto Rico.*—Manufacturer.
Castor oil, without taste or smell.

RUSSIA.

159.—Pitancier, G., *Odessa.*
Stearic acid candles.

SECTION I. CLASS III.

SUBSTANCES USED AS FOOD.

THIS Class includes all those articles in the Exhibition used as food, as well as some others, such as the preparations of tobacco, which are not properly thus designated. The Class is naturally divided into two distinct series—the one belonging to the vegetable kingdom, the other to the animal kingdom. The former, from the greater ease of preserving vegetable substances, is much the largest and most diversified; the latter series is chiefly represented by the modern and highly important discovery of alimentary preserves.

The contributions from the United States are by no means representative of the agricultural wealth of the country. With a few honorable exceptions, the contributions in this Class are meager and insignificant. An unusual apathy seems to have pervaded the producers of the country. An excellent series of the productions of Great Britain is contributed by the Royal Commissioners of the London Exhibition, the articles being selected from that Exhibition. The flourishing and fertile colony of British Guiana sends a full and beautiful suite of specimens of her productions. The seeds and dressed fiber of a remarkable and apparently very valuable variety of flax, are sent from Russia.

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1. HECKER & BROTHER, *Croton Mills, New York City.*—Manufacturers.
Various articles manufactured from the cereal grains, including patent self-raising flour, Graham flour, rye flour, white and yellow Indian meal, buckwheat, wheaten grits, samp and hominy, and Hecker's farina.

2. RAYMOND & SCHUYLER, *West Farms, Westchester County, New York.*—Manufacturers.
Specimens of fine flour and pearl barley.

3. BELLINO & VOGEL, *New York City.*—Manufacturers.
Samples of vermicelli, macaroni, etc.

4. CHAMBERLIN, J. H., & Co., *Akron City Mills, Newbern, Ohio.*—Manufacturers.
Samples of flour.

5. MILES & PECK, *Yonkers, Westchester County, New York.*—Manufacturers.
Wheat and rye flour; specimens of pearl barley, split peas, hominy, farina, oatmeal, etc.

6. JOHNSON, B. P., *Albany, New York.*—Corresponding Secretary of the New York State Agricultural Society.
Thirty varieties of wheat raised in the State of New York, viz.:—

1. Scotch Club.
2. Wild Goose.
3. Spanish.
4. Botany Bay.
5. Wiltshire.
6. Virginia Red.
7. St. Domingo.
8. White.
9. Tuscany.
10. Soules.
11. Zimmerman.
12. Chatham.
13. Kentucky White-beard.
14. White Flint.
15. Hutchinson.
16. Mediterranean.
17. Red-beard.
18. Mummy.
19. Siberian Spring Wheat.
20. Talavera.
21. Orange.
22. Wheatland Red.
23. Alabama.
24. Australian.
25. Etrurian.
26. Palestine.
27. Moab seed, from Arabia.
28. White Blue-stem.
29. Canada Flint.
30. English Red.

7. WELCH, J. S., *Shenandoah Mills, Clarke County, Virginia.*—Manufacturer.
Samples of family flour.

8. HINCKLEY, J. N., *Mumford, New York.*—Manufacturer.
Samples of Genesee flour.

9. HOTCHKISS, H. G. & L. B., *Lyons, New York.*—Manufacturers.
Corn meal, maize flour, and farina.

10. THOMPSON, S. L., *Setauket, Long Island.*
Samples of wheat, oats, and rye.

11. EARHART, ROBERTS & Co., *Winchester, Virginia.*—Manufacturers.
Samples of flour.

12. ADDISON & MEADE, *Alexandria, Virginia.*—Manufacturers.
Sample of Gale wheat.

13. HAWK, ISAAC, *Navarre Mills, Ohio.*—Manufacturer.
Two barrels of flour.

14. CARPENTER, N. B. C., *New York City.*—Agent.
Samples of buckwheat.

15. SUYDAM, CHARLES, *California.*—Producer.
A sample of wheat.

16. ROBARDS, A. S., & SON, *Hannibal, Missouri.*—Manufacturers.
Samples of flour.

17. POWELL, JOSEPH, *St. Louis, Missouri.*—Manufacturer.
Samples of flour.

18. VERDIN, P. S. L., *St. Charles, Missouri.*—Producer.
Samples of wheat.

19. HILL, C. J., & SON, *Rochester, New York.*—Manufacturers.
Samples of superfine Genesee flour.

20. BURNS, HUGH, *Oregon City.*—Producer.
Samples of Oregon white wheat.

21. MOSELY, W. S., *New Madrid, Missouri.*—Producer.
Samples of black oats, hominy, and pop corn.

22. LAFORGE, ———, *New Madrid, Missouri.*—Producer.
Samples of white oats.

23. BYRNE, ———, *New Madrid, Missouri.*—Producer.
Samples of large yellow corn.

24. THOMPSON, ———, *New Madrid, Missouri.*—Producer.
Samples of large white corn.

25. LE DUC, ———, Commissioner of Minnesota Territory.
Specimens of manonim, or wild rice; yellow and striped dent corn; flint corn; barley, winter wheat, and maple sugar.
[For description and figure of the wild rice, see the Illustrated Record, page 76.]

26. Zerega, Anthony, *Brooklyn, New York.*—Manufacturer.
Macaroni and vermicelli.

27. Lowber, *Shelby Center Mills, New York.*—Manufacturer.
Sample of flour.

28. Stanford, George, *Rhinebeck, New York.*—Manufacturer.
Sample of flour.

29. Kirtland, Benjamin P., *Cantonment Farm, Greenbush, New York.*—Producer.
Samples of Indian corn, and preparations of the same.

Varieties of corn in the ear:—

Eight-rowed white.	Dutton.	Evergreen sweet corn.
Twelve-rowed red.	Eight-rowed yellow.	Sweet corn.
Red pop.	Sixteen-rowed red.	Sixteen-rowed Dutton.
Blue pop.	Red blaze.	Early Canada.
White pop.	Eight-rowed yellow, on stalk.	Sweet corn, on stalk.
Yellow pop.	Ohio flint.	Rocky Mountain, or white corn.
Mixed pop.	Old Colony sweet corn.	

Preparations.	*Corn Shelled.*
Sweet-corn hominy.	Eight-rowed yellow.
Yellow-corn meal.	Red blaze.
Hominy.	Eight-rowed white.
White-corn grists.	Early Canada.
Prepared sweet corn.	Popped corn.
Sweet corn.	Rice corn.
Yellow-corn grists.	
Corn starch.	

30. Wayne, Mrs. William C., *Wilton Bluff, South Edisto River, South Carolina.*—Producer.
Four sheaves of rice, planted 10th March, and harvested 20th August, 1853.

31. Allston, Robert F. W., *Georgetown, South Carolina.*—Producer.
Samples of rice; and rough rice (paddy), of several years' growth, from 1845 to 1853, inclusive.

[The quantity in South Carolina, produced in 1851, was about 140,000 tierces. Consumption:—

Within the State, including loss and stock on hand		14,881 tierces.
Shipped to West Indies	18,967 tierces	
Shipped to Great Britain	14,115 "	
Shipped to France	5,129 "	
Shipped to North of Europe	22,136 "	
Shipped to South of Europe	697 "	
Total foreign		61,044 "
Shipped coastwise (some of which also was reshipped, and consumed in Europe		64,075 "
Total		140,000

The tierces average 600 lbs. net. The paddy, or rough rice, mentioned above, is included in this statement of exports, at the rate of twenty-one bushels to the tierce.]

32. Heriot, Dr. E. T., *Waccamaw, South Carolina.*—Producer.
Samples of rice.

33. Baker, Walter & Co.—Manufacturers.
Samples of cocoa.

34. Evans, Joseph D. (*Pekin Tea Company*), *New York City.*—Agent.
Specimens of fine teas in small packages.

35. Szadeczky, E. L., *New York City.*—Manufacturer.
Essence of Java coffee.

36. Bohler, Daniel, & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Essence of coffee.

37. Borden, Gail, *Galveston, Texas.*—Manufacturer.
Samples of meat-biscuit; extract of coffee.

38. Alden, C., *New York City.*—Agent.
Concentrated milk, cream-coffee, and prepared cream to use at sea.

39. Govaerts, Joseph, *New York City.*—Manufacturer.
An assortment of prepared chocolate.

40. Bowen, M. D., *South Assolie, Chenango County, New York.*—Manufacturer.
Samples of pine-apple cheese.

41. Wardell & Pease, *New York City.*—Manufacturers.
Specimens of pickled oysters, lobsters, and other alimentary preserves.

42. Crommelin, J. R., *Brooklyn, New York.*—Manufacturer.
Samples of pure mustard.

43. Harrison, Eaton & Co., *Cincinnati, Ohio.*—Manufacturers.
Samples of mustard, made from Western brown seed.

44. Haine & Kinsley, *New York City.*
Samples of American mustard.

45. Labiaux, J. L., *New York City.*—Manufacturer.
Brussels mustard.

46. Abbatt, W. M., & Co., *Burling Slip, New York.*
Specimens of preserved food.

47. Bonnard, Louis, *New York City.*—Manufacturer.
Alimentary preserves.

48. Webber, John P., *Beverly, Massachusetts.*—Manufacturer.
Specimens of manufactured mustard.

49. Pickardt, William, *New York City.*—Manufacturer.
Specimens of French mustard, put up in bottles and jars.

50. Dixon & Darst, *Cincinnati, Ohio.*—Manufacturers.
Specimens of mustard.

51. Walker, Charles W., *Brooklyn, New York.*—Manufacturer.
Specimens of mustard and ground spices.

52. Adams, James C., *Baltimore, Maryland.*—Producer.
Samples of bacon.

53. Tateosyan, H., *New York City.*
Oriental fig-paste.

54. Giessan, G. C., *New York City.*—Manufacturer.
Specimens of mustard prepared in various styles.

55. Wait, Geo. W. & Wm. C., *Baltimore, Maryland.*—Manufacturers.
Flour of mustard, put up in tin canisters and in bottles; ground spices of seven kinds, with samples of the crude articles, and showing the stages of manufacture.

56. Usher, R., *Louisville, Kentucky.*—Manufacturer.
Specimens of sugar-cured hams, and spiced beef.

57. Smith, Morgan L., *Texas.*—Producer.
Samples of muscovado and clarified sugar.

58. Havemeyers & Moller, *New York City.*—Manufacturers.
Specimens of refined sugar.

59. Kittredge, E. E., *Elm Hall, Parish of Assumption, Louisiana.*—Producer.
Samples of plantation sugar, made directly from the cane-juice as it flows from the mill.

60. La Price, P. M., *St. James Parish, Louisiana.*—Producer.
Samples of sugar made directly from the cane.

61. Polk, Leonidas, *Leighton Plantation, La Fourche Interior, Louisiana.*—Producer.
Samples of refined sugar, powdered, crushed, and in the loaf.

62. Fletcher, Thomas F., *Canaan, Vermont.*—Producer.
Samples of maple sugar.

[The whole amount of maple-sugar manufactured in the United States, according to the returns of the last census, in the year 1850, was 34,249,886 pounds. This amount undoubtedly falls short of the real quantity manufactured by at least one-third.

The following table exhibits the produce of the several States and Territories for the year 1850:—

	Pounds.		Pounds.
Maine	93,542	Mississippi	No returns.
New Hampshire	1,294,863	Louisiana	255
Vermont	6,349,357	Texas	No returns.
Massachusetts	795,525	Arkansas	9,330
Connecticut	56,796	Tennessee	158,557
Rhode Island	28	Kentucky	437,405
New York	10,357,484	Ohio	4,588,209
New Jersey	2,197	Michigan	2,439,794
Pennsylvania	2,326,525	Indiana	2,921,642
Delaware	No returns.	Illinois	248,904
Maryland	47,740	Missouri	178,910
Virginia	1,227,665	Iowa	78,407
District of Columbia	No returns.	Wisconsin	610,976
North Carolina	27,982	California	o returns.
South Carolina	200	Minnesota Territory	2,950
Georgia	50	Oregon	No returns.
Alabama	643	Utah	No returns.
Florida	No returns.	New Mexico	No returns.

In addition to the large production of sugar in the States, the estimated quantity manufactured by the Indians living east of the Mississippi is 10,000,000 pounds per annum; the quantity manufactured by those living west of the river is set down at 2,000,000 pounds, but is probably much greater.

The maple-sugar product of the Canadas in 1849 is stated as follows: Lower Canada, 2,303,168 pounds; Upper Canada, 4,160,667 pounds.

Of the several States, Vermont makes by far the largest quantity in proportion to its territory, and in some of the northern districts of this State the use of the cane-sugar is almost unknown.

In addition to the sugar crop, there was produced from the sugar-maple in 1850, in the United States, molasses to the amount of 40,000,000 gallons. Of this quantity New York produced 56,538 gallons, and Pennsylvania 80,652 gallons.

The local yearly production of maple-sugar in the United States, its Territories, and the British possessions, may be fairly considered as amounting to 60,000,000 pounds, with molasses to the amount of 50,000,000 gallons.

The improvements which have been made in the manufacture of maple-sugar during the last few years have been very great. Formerly the highest attainments in this manufacture only resulted in the production of a fine muscovado-like sugar; but now, by improved processes, specimens are annually exhibited at the various agricultural fairs, vying with the most beautiful loaf-sugar. This has been effected by a greater attention to cleanliness in the preparation of the sap, and the improvements in the method of graining and refining the sugar.

In 1847 a premium was awarded by the Oswego County Agricultural Society, New York, to Mr. R. Tinker, for the following improved method of preparing maple-sugar:—The sap is boiled in a potash and caldron-kettle to a thick syrup; strain it when warm, let it stand twenty-four hours to settle, then pour it off, leaving back all that is impure. To clarify fifty pounds, take one quart of milk, one ounce of saleratus, and the whites of two eggs, well mixed; boil the sugar again until it is hard enough to lay upon a saucer; then let it stand in the kettle and cool. Stir it a very little to prevent caking in the kettle. For draining use a tube, tunnel-shaped, fifteen inches square at the top, and coming to a point at the bottom. Put in the sugar when cold, tap it at the bottom, and keep a damp flannel cloth of two or three thicknesses on the top of the mass. When drained dissolve the sugar in pure warm water, and clarify and drain as before.

The sugar-maple tree flourishes throughout most of North America. Its height is often upwards of one hundred feet. It is a highly ornamental tree, loves a cold climate, and makes excellent fuel. The sugar-maple is said to live for two hundred years.

In the production of sugar, an orchard of maple-trees is almost equal to a field of sugar-cane of the same area. An open winter, constantly freezing and thawing, is the forerunner of a bountiful crop of sugar. In the older States of the Union the great demand for timber and fuel, and the increased cutting, tends yearly to lessen the amount of sugar produced. In the more recently settled States of the North-west, the production of sugar is on the increase.]

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63. Wines manufactured from the Isabella and Catawba grape are exhibited by the following persons:—

Duhme, H., *Cincinnati, Ohio.*
Rehfuss, L., *Cincinnati, Ohio.*
Dollé, —, *Franklin County, Missouri.*
Gealing, Ludwig, *Franklin County, Missouri.*
Wilkin, Theodore, *Franklin County, Missouri.*
Gerhard, Julius, *Missouri.*
Bush, G. L., *Franklin County, Missouri.*
Heinrichs & Co., *St. Louis, Missouri.*
Lemp, A., *St. Louis, Missouri.*
McDonald, J. C., Dr., *Aiken, South Carolina.*
Werk, M., *Cincinnati, Ohio.*
Rommel, Jacob, *Hermann, Missouri.*
Paschal, Michael, *Hermann, Missouri.*
Frick, Frederick, *Hermann, Missouri.*
Wolf, C. J., *Washington, Missouri.*
Glasgow, William, *St. Louis, Missouri.*
Boller, John H., *Boonville, Missouri.*
Bogen, G & P., *Cincinnati, Ohio.*

[The following note upon the vine culture in Missouri is taken from a communication of William Glasgow, Esq., of St. Louis:—

The history of vine culture in Missouri is of very recent date. The first vineyard of which I have any knowledge was planted by the writer at his present residence, in the suburbs of St. Louis, in the spring of 1844. It was two acres in extent, and comprised two thousand Catawba vines. They bore fruit in 1847, from which a barrel of wine was made, a sample of which was exhibited before the Horticultural Society, and obtained a premium the following year; and this it is probable was the first wine made in quantity from the Catawba or any other cultivated grape in this State.

Soon after, however, other small vineyards were planted in this vicinity, but it was not till 1846 that any important progress was made in vine culture. In the spring of that year the German residents of Hermann, in Gasconade county, planted out twenty-five thousand Catawba vines on the slopes and hill-sides around that town. They grew well, and in 1848 produced a good crop of grapes, from which wine of an excellent quality was made; which being much sought after, and sold at fair remunerating prices, gave great encouragement to cultivators and additional stimulus to vine culture in that quarter. Existing vineyards were enlarged and new ones formed, and as each succeeding year more fully demonstrated the fitness and capacity of soil and climate, the culture steadily increased, until it has become one of the most important sources of wealth to the community, and Gasconade county the chief wine-growing district of the State.

The German residents of the adjoining county of Franklin also engaged in it with the proper energy and spirit, and their romantic and picturesque hills bid fair to rival in the quantity as they already do in the quality of their productions the older and more extensive vineyards of their enterprizing neighbors.

Numerous and well-conducted vineyards are also to be found in the counties of Cooper, St. Charles, Warren, St. Louis, and St. Genevieve, from all of which wine of a good quality is made.

Most of the vineyards are as yet small, the largest being about ten acres in extent, but are rapidly increasing in magnitude and numbers.

There is now in cultivation about as follows:—

	Acres.
In the county of Gasconade	500
In the county of Franklin	100
In the county of Cooper	20
In the county of St. Louis	10
Other counties	20
Making in all	650

It must be borne in mind that most of these vineyards are young, and have not yet come into bearing, and that therefore the product we have to give is comparatively small. The yield last year was about 15,000 gallons, but will this year reach 40,000 gallons, and probably next year double that quantity.

If we take 200 gallons of wine as the *average* yield of an acre in full bearing, which is not far from the truth, we ought to have from the ground already devoted to this culture, a product of not less than 120,000 gallons, worth as many dollars; but when we consider that every year is strengthening the judgment of the pioneers in this business as to the peculiar fitness of our hills and uplands, there is every reason to believe that the product will be steadily increased, and that the day is not distant when our rich and pleasant wines will take an important position among the great staple commodities of the country.

Missouri is naturally a wine-growing State. Our river-bottoms and highest hills are covered with indigenous vines, so thickly set in some localities as to form complete natural vineyards, bearing abundance of fruit, whilst cultivated vines grow with a luxuriance almost unknown elsewhere. The vines here, and probably also throughout most of the Western States, have thrice the magnitude of those in the French and Italian vineyards of the same age, and are consequently capable of bearing corresponding crops.

The only drawback we have to almost unlimited production, is the "rot," which is more or less destructive every year.

The method pursued in making wine is generally as follows:—The grapes are gathered when thoroughly ripe, which is about the 1st of October, and on a dry day; and after all green and defective berries are picked out, mashed in a tub with a pounder. They are then thrown into a cask and allowed to stand from twelve to twenty-four hours, or until a slight fermentation takes place, after which they are pressed out and the wine put into clean casks, previously sulphured, and stored in a cool cellar. There it is allowed to remain until about the 1st of December, when it is drawn off from the lees and returned to the casks, and fined down with isinglass and bottled about the first of May. It should, however, remain in the cask, bung-full during the following summer, and be bottled the next winter or spring.]

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64. Whitlock, Nichols & Co., *New York City.*—Agents.
Specimens of tobacco, sugar, and cotton plants. Samples of fine manufactured Virginia tobacco.

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65. Allen, Julius, *New York City.*—Importer.
Cigars of various kinds.

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66. Tannenbaum, J., *New York City.*—Manufacturer.
Specimens of Connecticut tobacco, and various cigars.

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67. Boggs, William, & Co., *New York City.*—Manufacturers.
Fine cut tobacco.

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68. Anderson, John, *New York City.*—Manufacturer.
Samples of manufactured tobacco.

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69. Beary, Walter W., *Baltimore, Maryland.*—Agent.
Leaf tobacco.

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70. Hoffman, J. B., & Co., *Albany, New York.*—Manufacturers.
Tobacco of various kinds.

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71. Bryant, W. G., *Warren County, Missouri.*—Producer.
Leaf tobacco.

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72. McCall, Charles W., *St Louis, Missouri.*—Manufacturer.
Specimens of manufactured tobacco.

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73. Hackenburgh & Co., *New York City.*—Agents.
Samples of leaf tobacco.

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74. Fortune, R. C., *Clarksville, Missouri.*—Producer.
Samples of Oronoco leaf tobacco, manufactured.

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75. Hotchkiss, Fenner & Co., *New York City.*—Manufacturers.
Samples of manufactured tobacco.

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76. Maxwell, E., *New York City.*—Agent.
Sample of tobacco.

GREAT BRITAIN AND IRELAND.

77. Charlwood & Cumminos, *Covent Garden, London.*
Twenty samples of varieties of wheat, and twelve varieties of oats, from the sheaf.

78. Noble, Cooper & Bolton, *London.*
An extensive assortment of garden-seeds and grass-seeds.

79. Moore, Edward Duke, *Ranton Abbey, Eccleshall, Stafford.*—Patentee.
Preserved milk, and paste of chocolate and milk.

80. Noak, W. & John, *Covercroft, Salt Works, Droitwich.*—Manufacturers.
Brine, and varieties of salt; brisk, Lymington, fine table, agricultural, Malden, broad, and bay salts.

81. Glass, George Michael, *Brandon Street, Walworth.*—Manufacturer.
Three varieties of gelatine, and gelatine voice-lozenges.

82. Dufaville, W., *Broughton House, Islington.*—Manufacturer.
Fish-isinglass and calf gelatine.

83. Dewar, Thomas, *Newcastle-upon-Tyne.*—Manufacturer.
White and brown mustard-seed and mustard.

84. St. Etienne, Madame Daniele, *Harberton Ford, Totness.*—Producer.
Preparations from potatoes, in the form of macaroni, for preservation in long voyages, and for making puddings and soups.

85. H. R. H. Prince Albert.—Producer.
White Chidham wheat, winter oats, and Augusta beans.

86. Wrench, R., & Son, *London Bridge.*—Producers.
Specimens of various grains and seeds, familiarly known in the London market.
Wheats.—Honry rough-chaffed (or velvet), Spalding, Taunton Dean red Lammas, white-chaff red, golden drop, Clover's, Talavera, Chidham, Hunter's, April spring, Breton, Fenton, Fuller's blood-red, and Wellington white wheats.
Oats.—Potato, sandy, early Birley, Hopetown, red Kent, black Tartarian, and Poland oats.
Naked, Chevalier, and black barleys; maple peas; early Mazagon, old English, and Fullardstick beans; Kent rye; winter tares; flaxseed; canary and rape seed; trefoil-seed; red clover-seed, and seed of trifolium incarnatum.

87. Asprey, James, *Sandleford, near Newbury, Berks.*
White trump wheat.

88. Croughton, William, *Peel, Tenterden, Kent.*—Producer.
Light golden-pod and dark golden-pod beans.

89. Paine, H., *Birdbrook, Moab, near Halstead.*—Producer.
Defiance rivet wheat.

90. Raynbird, Robert, *Hengrave, near Bury St. Edmund's.*—Producer.
Kessingland wheat, and Chevalier barley.

91. Raynbird, Hugh, *Laverstoke, Andover Road, Hampshire.*—Producer.
Hybrid wheat.

92. M'Killican, James, *Piperhill, Cawdor, Scotland.*—Producer.
White wheat.

93. Chitty, Edward, *Guildford.*—Manufacturer.
Best white flour.

94. Sutton, John, & Sons, *Reading.*—Producers.
Skinless Chevalier barley; a new variety.

95. Sadler, William James, *Swindon, Wilts.*—Producer.
Crystal white wheat.

96. Gibson, Charles, *Pitlochry, Perth.*—Producer.
English barley.

97. Bexley, Lord, *Footscray, Kent.*—Producer.
White chittim wheat.

98. Fordham, Thomas, *Snelsmore Hill East, near Newbury.*—Producer.
Hybrid white wheat and prolific beans.

99. Lawson, Peter, & Sons, *Edinburgh.*—Producers.
Specimens of vegetable productions used for food in Scotland, comprising the following:—
Oats.—Sandy, old black, winter dun, black Tartarian, Scotch berlie, early Liberian, potato, and Hopetown oats.
Scotch bere or big (barley); Annets, Chevalier, and Peruvian barleys.
Wheats.—Hopetown, Talavera, red chaff pearl, white Essex, Hunter's, Fenton, red fern, golden drop, red Lammas, Spalding's and Clover's red wheats; Hopetown wheat, grown at Yester; Tweedale wheat.
Peas and Beans.—Auvergne, Milford, marrowfat, dwarf imperial, and maple or partridge-field peas; common Scottish-field, small winter-field, and winter-field beans.
Common or winter rye; Scotch and Hopetown tares; Scotch perennial and Italian rye-grasses; purple-top Swedish, purple-top, yellow-globe, and yellow-tankard turnip seeds.

100. Juson, W., *Red Hill, Shrewsbury.*—Producer.
Fine white flour.

101. Snowden, Robert, *City Road and East Road, London.*—Inventor and Patentee.
Coffee, roasted by a patent process in enameled cylinders; specimens of crushed coffee-berries; refuse fiber and coffee after the removal of the fiber.

102. Golding, Robert, *Hunton, Maidstone.*—Manufacturer.
Mid-Kent hops.

103. Ashburnham, Lady Juliana, *Broomham, near Hastings.*—Producer.
Hops grown in Sussex.

104. Richardson, Timothy, & Sons, 6 *Duke Street, Southwark.*
Jones' hops.

105. Taylor, John, & Sons, *Bishop Stortford, Herts.*—Manufacturers.
Amber-colored, white, and brown malts.

106. Illingworth, Alexander, *Banchory Ternan, Scotland.*—Producer.
Barley, Scotch birley-oats, and perennial rye-grass seed.

107. Payne, George, *Cowes, Isle of Wight.*—Manufacturer.
Royal Osborne sauce.

108. Grace, Daniel, *Brighton.*—Manufacturer.
Mushroom spawn.

109. Heard & Son, *Fore Street, Bridgewater.*—Manufacturers.
Rich Somersetshire camp-sauce.

110. Bycroff, Richard, *Paradise Walsoken, near Wisbeck, Cambridgeshire.*—Manufacturer.
Samples of mustard.

111. Du Barry & Co., *Regent Street, London.*—Manufacturers.
Samples of farinaceous substances.

112. Maine, Joseph, 7 *Union Court, London.*—Manufacturer.
Samples of gelatine.

113. Lea & Perrins, *Worcester, England.*—Manufacturers.
Worcestershire sauce.

114. Fay, J. S., & Sons, *Bristol.*—Manufacturers.
Soluble cocoa, native and manufactured.

115. Fandenilhe, V. B., *Newington Cross, Surrey.*—Inventor and Manufacturer.
Solidified milk.

BRITISH COLONIES.—CANADA

116. Blouin, Hypolite, *Berthier, Eubas, Canada East.*—Producer.
Sample of timothy-seed.

117. Boivin, Louis, *Cacouna, Canada East.*—Producer.
Sample of wheat.

118. Pacquet, M., *Quebec District, Canada East.*—Producer.
Samples of beans.

119. Contine, Faançois, *St Ambroise, Canada East.*—Producer.
Samples of skinless barley, and Canadian oats.

120. Paré, George, *St. Roch's, Quebec, Canada East.*—Manufacturer.
Samples of cigars.

121. Lambly, *Quebec, Canada East.*—Proprietor.
Maple-sugar and syrup.

122. Dutille, Louis, *St. Joseph, Canada East.*—Manufacturer
Samples of maple-sugar.

123. Bailey, J. W., *Megantic, Canada East.*—Manufacturer.
Sample of maple-sugar.

124. Lamère, Madame, *St. Laurente, Canada East.*—Producer.
Samples of colored beans.

125. Muir, J., *Hinchinbroke, Canada East.*—Manufacturer and Producer.
Samples of wheat, of cheese, of peas, and of oats.

126. McNaughton, Angus, *Hinchinbroke, Canada East.*—Producer.
Samples of honey, and of peas.

127. Robb, John, *Montreal, Canada East.*—Manufacturer.
Samples of wine-crackers.

128. Trenholm, Edward, *Kingsy, Canada East.*—Producer.
Samples of buckwheat-flour.

129. Reinhart, C., *Montreal, Canada East.*—Producer.
Samples of haws.

130. Westover, Asa, *Dunham, Canada East.*—Producer and Manufacturer.
Samples of maple-syrup and of maple-sugar.

131. Rousseau, Betsy, *St. Hilaire, Canada East.*—Manufacturer.
Samples of maple-sugar in cakes and granulated.

132. Bartlett, Smith, *Belleville, Canada West.*—Producer.
Sample of peas.

133. Carpenter, John B., *Townsend, Canada West.*—Exhibited by the Agricultural Society of Toronto.
Sample of wheat.

134. McMullen, R., *Toronto, Canada West.*—Manufacturer.
Samples of snuff.

135. Sinclair, P. C., *Cobourg, Canada West.*—Manufacturer.
One dozen bottles of Cobourg sauce.

136. Thompson, E. W., *Toronto, Canada West.*—Producer.
Samples of barley.

137. Herring, James, *Toronto, Canada West.*—Producer.
Sample of white marrowfat peas.

138. Priffier, A., *Ransom Mills, Waterdown, Canada West.*—Manufacturer.
Sample of flour, extra superfine.

139. Ewart, J. D., *Dundas, Canada West.*—Manufacturer.
Samples of flour.

140. Silverthorne, Francis, *Toronto Township, Canada West.*—Producer.
Samples of pot and pearl barley.

141. Cummer, L. A., *Waterdown Mills, Canada West.*—Manufacturer.
Samples of flour ("superfine double-cooled").

BRITISH COLONIES.—NEWFOUNDLAND.

142. Newfoundland Agricultural Society, *St. John's.*
Barley and oats.

143. Bully & Mitchell, *St. John's.*
Preserved salmon.

144. Des Barres, Judge, *St. John's.*
Caplin, a species of fish, smoked.

145. The Newfoundland Committee.
Dried codfish and pickled herrings.

BRITISH COLONIES.—PRINCE EDWARD'S ISLAND.

146. The Royal Agricultural Society.
Specimens of agricultural productions, comprising wheat, buckwheat, white oats, black oats, pearl barley, timothy and red clover seed, and raw flax; also oatmeal, cheese, butter, lard, and a variety of furs.

BRITISH COLONIES.—GUIANA.

147. Porter, Thomas, *Demarara.*—Producer.
Vacuum pan-sugar; rum, uncolored, 62° per cent. over-proof, temperature, 80° Fahrenheit; colored rum, 37° per cent. over-proof, 79° Fahrenheit.

148. Anderson, George, *Demarara.*—Producer.
Vacuum pan-sugar, and loaf-sugar.

149. Laing, James, *Berbice.*—Producer.
Various samples of sugar.

150. Henery, W. P. & E. T., *Berbice.*—Producers.
Samples of sugar; keg of rum; rice from Canje Creek.

[The Colony of British Guiana, in addition to its own consumption, produced and shipped, during the year 1852—

Sugar	55,700 hogsheads.
Rum	24,520 puncheons.
Molassea	10,075 puncheons.]

151. Townsend, G. P., *Berbice.*—Producer.
Rice from Canje Creek.

152. Cullen, John, *St. Rose's Mission, Pomeroon.*—Producer.
Samplea of rice, cocoa-seeds, and tobacco; starch, from bitter cassava.

153. McClintock, W. C., *Pomeroon.*—Producer.
Maize; coffee, cultivated by the Indians; dried and sliced bread-fruit.

154. Stuchbury, J. S., *Demarara.*—Producer.
Maize; pigeon-peas, dried (*Cajanus flavus*, L.); capsicums, dried and ground; fruit of the *birambi.*

155. Netscher, A. D. Vander Von, *Demarara River.*—Producer.
Coffee, in the husk, cleaned, and pearl; cocoa-seeds, with and without the husks.

156. Tighe, George, *Demarara.*—Producer.
Coffee, pearl; plantain-meal; cassareep, the inspissated juice of the bitter cassava root.

[Cassareep is the concentrated juice of the roots of bitter cassava, and the basis of the West Indian dish "pepper-pot." One of its most remarkable properties is its high antiseptic power, preserving any meat that may be boiled in it for a much longer period than can be done by any other culinary process. Cassareep was originally a Buck or Indian preparation, and has often been described, with more or less accuracy. It is well known, that some of the Dutch planters of this colony have, by means of the addition of a small quantity of cassareep, from time to time, to varieties of animal food, been enabled to keep up, in daily use, the same pepper-pot for many years.]

157. Ross, D. J., *Essequebo.*—Collector.
Seeds of stinking-weed (*Cassia occidentalis*, L.), said to be a substitute for coffee.

158. Holmes, W. H., *Demarara.*—Producer.
Capsicums, preserved in acetic acid; varieties of pickles.

159. Blair, Daniel, *Inner Island, Demarara.*—Producer.
Unripe plantains, preserved in alcohol; plantains sliced and dried, to be converted into meal; plantain-meal, or *conquin-tay;* starch, from plantain; vinegar, made from ripe plantains; and plantain-fiber.

[Plantain-meal is prepared by stripping off the husk of the plantain, slicing the core, and drying it in the sun. When thoroughly dry, it is powdered and sifted. It is known among the Creoles of the colony under the name of "conquin-tay." It has a fragrant odor, acquired in drying, somewhat resembling fresh hay or tea. It is largely employed as the food of infants and invalids. As food for children and convalescents, it would probably be much esteemed in Europe; and it deserves a trial, on account of its fragrance, and its being exceedingly easy of digestion. In respect of nutritiveness, it deserves a preference over all the pure starches, on account of the proteine compounds it contains. The plantain-meal would probably be best and freshest were the sliced and dried plantain-cores exported, leaving the grinding and sifting to be done in Europe. The flavor of the meal depends a good deal on the rapidity with which the slices are dried; hence, the operation is only fitted for dry weather, unless, indeed, when there was occasion for it, recourse were had to a kiln or stove.

Plantain-starch cannot enter into commercial competition with other starches. The difficulty of separating it from the rest of the constituents of the fruit, its unusual color, and the high value of the fruit, in its other applications, will probably prevent its being considered but as a curiosity. The color in this sample resisted the free application of chlorine water. A few particles of this starch, under the microscope, showed irregularly oval corpuscles, and some oblong, varying from 1-475th to the 1-950th of an inch in long diameter, and, in most cases, the 1-425th of an inch in breadth. A few globules, almost spherical, were observed, measuring the 1-3800th of an inch. As the color, however, is sufficient to identify this starch, no aid from measurements or shape of its globules is required.

Vinegar from the plantain is obtained by a very simple process. When there is a temporary glut in the market, the surplus, when yellow, is thrown into baskets, supported on open barrels. The fruit liquefies and drops into the receiver, where the juice ferments, and speedily becomes vinegar. No water is used in the process.]

160. Blair, Mrs., *Inner Island, Demarara.*—Producer.
Fruit of the banana, ripe, and dried in sugar.

161. Ross, George, *Demarara River.*—Producer.
Plantain-meal, or conquin-tay.

162. Cartwright, H., *Essequibo.*—Producer.
Farina of the bread-fruit.

163. Donald, Mrs., *Demarara.*—Producer.
Dried fruit of the vanilla.

164. McClintock, Mrs., *Pomeroon.*—Producer.
Dried roots and meal of bitter cassava; cassareep.

165. Haly, Mrs., *Demarara.*—Producer.
Meal of bitter cassava, baked.

166. Garnett, H. T., *Essequibo.*—Producer.
Bread, made from bitter cassava; arrow-root.

167. Stuchbury, Mrs., *Demarara.*—Producer.
Sweet cassava, and meal.

168. Croal, John, *Demarara.*—Producer.
Arrow-root.

FRANCE.

169. Jacquemin, P., *Meursault, Cote d'Or.*—Producer.
Flacons of mustard, in the seed, and manufactured for use.

170. Bordin, *Paris.*—Manufacturer.
Mustard, vinegar, and pickles.

171. Sigaut, *Paris.*—Manufacturer.
Rheims biscuits, dried pastry, and gingerbread.

172. Leroy-Dubois, *Illies, Nord.*—Proprietor.
Samples of wheat.

173. Perron, *Paris.*—Manufacturer.
Decorated chocolate, of various descriptions.

174. Menier & Co., *Paris.*—Manufacturers.
Superfine chocolate; pearl and shelled barley, and gruel.

175. Gremailey, Sen., *Gray, Haute-Saone.*
Alimentary preserves (French cooking).

176. Basset, B., *La Rochelle, Charante Inferieure.*
Specimens of sardines in oil, and truffes.

177. Roedel & Sons, *Bordeaux, Gironde.*
Specimen of preserved food.

178. Fiton, J., Sen., *Bordeaux, Gironde.*
A variety of alimentary preserves.

179. Duchemin, Jr., *Tours, Indre-et-Loire.*
A large variety of specimens of preserved meats, vegetables, game, and choice fruits.

180. Rousseau, *Paris.*
Preserved fruits, of various sorts.

181. Pellier, A. & E., *Mans, Sarthe.*
Bottles and boxes of alimentary preserves.

182. Gillet, Aug., *Kneval, Morbihan.*
Boxes of sardines in oil, and various other alimentary preserves.

183. Bonzel & Hourriez, E., *Haubourdin, near Lille, Nord.*—Manufacturers.
Samples of coffee and chicory, in powders, cakes, and lozenges.

184. Jeancloude & Co., *Paris.* (Agent, J. P. Brunemaire.)
Specimens of butter.

185. Choquart, C., *Paris.*—Manufacturer.
Specimens of chocolate.

186. Apperat, Chevalier, *Paris.*—Manufacturer.
Preserved, roasted, and stuffed mutton, and other alimentary preserves.

187. Bergeret, E., & Co., *Roanne, Loire.*
Six jars of preserved potatoes.

188. Mauprivez, *Cressy, near Compiégne, Seine.*—Producer.
Samples of prepared chocolate.

189. Chollet & Co., *Paris.*
Samples of desiccated vegetables of various sorts, and solidified milk.

[The vegetable designed to be acted upon is first picked and washed; then placed in a large drying-room, fitted with shelves and sieves, for the spreading, shaking, and turning of the vegetables during the drying, and supplied with dry air at a temperature of 95° to 100° Fahrenheit, and from which the moist air is discharged through chimneys; after this, they are subjected to pressure, formed into tablets of a certain size, wrapped in tin foil, and then packed in tin cases for preservation, and for sending away.

To prepare this for use, it is only necessary to steep it for one hour in warm water, and then cook the same as the fresh vegetable.

The following is an extract from the annals of the Central Horticultural Society of France, 1851:—

"It appears that there is established in Paris, at No. 5 Rue Marbeuf, under the direction of Messrs. Chollet & Co., a manufactory for the preparation, by the process of M. Masson, of vegetable substances, with which the French navy and commercial marine are furnished. The Horticultural Committee pronounce the opinion that the desiccating process of M. Masson preserves vegetables without altering their constitution, and reduces them to a very small bulk without impairing their flavor or nutritive qualities.

"M. Masson's processes are applied, with entire success, to most vegetables, and to several fruits. Thus all cabbages, spinnage, parsley, cress, chervil, succory, and sorrel, are dried and pressed to a very small volume. It is the same with carrots, turnips, parsnips, celery, salsify, and viper's grass, which are cut in thin slices, and into small pieces, to make julienne. Cauliflowers, Brussels sprouts, asparagus, and string-beans, in order to resume their natural appearance, should not be pressed. Potatoes are perfectly preserved in thin slices. Peas and beans, in a green state, are succeeded with very well. Lastly, various fruits also; and especially apples and pears, in slices, are dried, and keep perfectly well."]

THE GERMAN STATES.

190. Carstansen, A. F., Jr., *Duisburg, Rhenish Prussia.*—Manufacturer.
Samples of tobacco, snuffs, and cigars.

191. Euprecht, E., *Mittelwalde, Baden.*—Manufacturer.
Samples of snuff.

192. Gotzenleucher, Simeons & Co., *Offenbach-on-the-Maine.*—Manufacturers.
Samples of snuff.

193. Engelhardt, Fred., *Resselsheim, Hesse.*—Manufacturer.
Samples of chicory.

194. Bernard, Brothers, *Offenbach-on-the-Maine.*—Manufacturers
Samples of rappee and other snuffs.

195. Bestelmeyer, Brothers, *Nuremberg, Bavaria.*—Manufacturers.
Several varieties of cigars.

196. Schroeder & Sandfort, *Mentz, Hesse.*—Producers.
Specimen of German and Bohemian hops.

197. Seelig, David, *Düsseldorf, Prussia.*—Manufacturer.
Specimens of cigars.

198. Saloman, J. A., & Co., *Brunswick.*—Producers.
Specimens of succory.

199. Dinkel, Mayer, *Mannheim, Baden.*—Producer.
Samples of hops.

200. Requard, *Bremen, North Germany.*—Manufacturer.
Cigars of various descriptions.

201. Carstens, D. H., *Lubeck, North Germany.*—Manufacturer.
Preserved vegetables, poultry, fish, fruits, and milk.

202. Graff, Carl, *Bingen, Hesse-Darmstadt.*—Manufacturer.
Specimens of snuffs and tobacco.

203. Seeliger, Charles S., *Wolfenbüttel, Brunswick.*—Manufacturer.
Samples of chicory; starch, from fine wheat.

THE AUSTRIAN EMPIRE.

204. Frolich, J. S., *Pesth, Hungary.*—Producer.
Specimens of tobacco.

THE ITALIAN STATES.

205. Rubino, Antonio, *Nice, Sardinia.*—Manufacturer.
Specimens of fine chocolate and cocoa.

206. Torniellı, Marquis, *Novara, Sardinia.*—Producer.
Specimens of fine white rice, cleansed by a new process, invented by Signor Uglietta, of Novara.

207. Viora, Filippo, *Cherasco, Sardinia.*—Manufacturer.
Specimens of syrup and lozenges of tamarinds, prepared by a new method.

208. Astengo, Matteo, *Savona, Sardinia.*
Specimens of vermicelli, or paste of Genoa.

209. Valdetaro, G., *Genoa.*—Manufacturer.
Various specimens of fine and superfine paste of Genoa, or vermicelli.

210. Cambi, Pigliu, *Buti, Tuscany.*—Manufacturer.
Superfine olive oil.

211. Ricasoli, Baron Bettino, *Florence.*—Manufacturer.
Superfine olive oil.

212. Amadeo, Giacomo, *Port Maurizio, Sardinia.*—Manufacturer.
Specimen of olive oil.

213. Paoletti, Giuseppe, *Pontedara, Tuscany.*
Manufactures of flour.

BELGIUM.

214. Claus & Caron, *Ghent, East Flanders.*—Manufacturers.
Samples of candied and other sugars.

THE NETHERLANDS.

215. Janssen, N. H. A., *Hertogenbosch.*—Manufacturer.
Alimentary preserves.

216. Fer Horst, W., & Co., *Leeüwarden.*—Manufacturers.
Samples of chicory.

217. Wilson & Co., *Meppel.*—Manufacturers.
Specimens of wine-vinegar.

218. Heuveldop, H. &. E., & Co., *Leeüwarden.*—Manufacturers.
Specimens of chicory mixture for coffee.

219. Herman, Lobry & Co., *Dochum.*—Manufacturers.
Chicory mixture.

220. Schooneveld & Westerbaan, *Gouda.*—Manufacturers.
Farina, sago, and syrup, manufactured from potatoes.

NORWAY.

221. Thanlow, D. H. A., *Modum.*—Producer.
Samples of Vasa rye.

RUSSIA.

222. Falkers-aborf, Loon, *Courland.*
Seed of winter flax, and samples of a beautiful silk-like flax prepared from it.
Samples of summer flax.

CUBA.

223. Cook & Favarger, *Havana.*
Specimens of Havana cigars.

224. Mateo, Saenz & Co.—*Havana.*
Havana cigars.

225. Garcia, ——, *New York City.*
Havana cigars.

226. Casamajor, H., *New York City.*
Sugar.

LIBERIA.

227. Lynch, Captain, *United States Navy.*
Specimens of coffee, cocoa, and sugar.

MEXICO.

228. Bromer, F., *Papantla.*
Vanilla beans.

HAYTI.

229. Faustin I., *Emperor of Hayti.*
Specimens of coffee, chocolate-nuts, castor-beans, honey, and starch.

SECTION I. CLASS IV.

VEGETABLE AND ANIMAL SUBSTANCES USED IN MANUFACTURES.

The first section, embracing the raw materials of the exhibition, ends with the present class. The substances included in this, as in the three preceding classes, present great diversities in their qualities and origin. They belong to two distinct series—substances of vegetable, and substances of animal origin. The extent of the class was not so great as to make it expedient to observe this division in the arrangement of its sections. Certain articles, as gelatine and starch, employed in some of their forms for food, are shown in this class as they are prepared on a large scale for manufacturing purposes.

Although the various organic products in this class are called raw materials, and owe their value chiefly to the powers and operations of nature, the majority of them have been subjected to such preliminary operations as fit them for the manufacturer, and which have modified their natural properties and greatly enhanced their worth. The individual merit of exhibitors is shown in improving and perpetuating useful peculiarities which occur in nature by happy accident—in protecting the raw material during its growth—and in removing from the mature product useless, less valuable, or heterogeneous substances. The invention, skill, and patient industry of man are fully required to ameliorate and perfect for human use the substances of this class; several instances of well-directed and successful efforts are found in its catalogue.

The collection, viewed as a whole, furnishes a very incomplete representation of the multifarious and almost endless number of substances employed in manufactures. This necessarily arose from the widely different views entertained in different quarters as to the kind of substances which it was proper and useful to exhibit. Some exhibitors have sent full examples of raw and partly prepared produce; while it is manifest from the meagre collections of others, that mere raw materials were considered of little importance; and sometimes staple productions are not represented at all. The extensive collection of woods from British Guiana is worthy of particular attention for the novelty, beauty, and promise of useful qualities of the specimens exhibited.

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1. Holmes, Joseph E., *New York.*—Proprietor.

Specimens of American woods, cut transversely from the log. Among them are the following:—

1. Pines, *Pinus strobus and P. rigida.*
2. Hackmatack, *Larix Americana.*
3. Fir, *Picea balsamifera.*
4. Hemlock, *Abies Canadensis.*
5. Cucumber tree, *Magnolia acuminata.*
6. American elm, *Ulmus Americana.*
7. Slippery Elm, *Ulmus fulva.*
8. Mockernut Hickory, *Carya tomentosa.*
9. Shellbark Hickory, *Carya alba.*
10. Butternut, *Juglans cinerea.*
11. Black Walnut, *Juglans nigra.*
12. Black Birch, *Betula lenta.*
13. Buttonwood, *Platonus occidentalis.*
14. White Oak, *Quercus alba.*
15. Red Oak, *Quercus rubra.*
16. Black Oak, *Quercus tinctoria.*
17. Rock Oak, *Quercus montana.*
18. White Ash, *Fraxinus acuminata.*
19. Black Ash, *Fraxinus sambucifolia.*
20. Mountain Ash, *Pyrus Americana.*
21. White Wood, *Liriodendron tulipefera.*
22. Sumach, *Rhus typhina.*
23. Alder, *Alnus serrulata.*
24. Black Cherry, *Cerasus serotina.*
25. Swamp Maple, Striated Maple, Red Maple, } Varieties of the *Acer rubrum.*
26. Sugar Maple, *Acer saccharinum.*
27. Striped Maple (Moosewood), *Acer Pennsylvanicum.*
28. American Beech, *Fagus sylvatica.* Red Beech, variety.
29. Chestnut, *Castanea Americana.*
30. Iron Wood (Hop Hornbeam), *Ostrya Virginica.*
31. Wild Plum, *Prunus Americana.*
32. Willow, *Salix sp.*
33. Osier, *Salix viminalis.*
34. Poplar, *Populus grandidentata.*
35. Aspen, *Populus tremuliformis.*
36. Tupelo (Pepperidge), *Nyssa multiflora.*
37. Shad bush (Swamp Pear), *Amelanchier Canadensis.*
38. American Boxwood (Flowering Dogwood,) *Cornus florida.*
39. Thorn-tree, *Crataegus crusgalli.*
40. Bass-wood (American Lime or Linden) *Tilia Americana.*
41. Sassafras tree, *Sassafras officinale.*
42. Grape vine, *Vitis vinifera.*

And many small shrubs.

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2. Stuart, Charles B., 69 *East 23d St., New York.*—Agent.

Various specimens of imperishable timber, prepared in Rochester, New York, on the patent method of Charles Payne, of England—consisting of specimens of Lime-tree, *Tilia Americana;* White wood, *Liriodendron tulipifera;* Scotch fir, *Pinus sylvestris;* Acacia; White Oak joists, for posts; Elm paving block, exceedingly hard and tough; White Cedar, *Cupressus thyöides;* a piece of railroad tie; Cotton-wood, from New Orleans; Chestnut, rendered of a quite dark color; White Pine, rendered heavier and darker colored; Ash; Red Elm, for fence boards; Black Walnut; a piece of White Cedar, to show the difference between the non-Payneized and the preserved timber.

[The preservative agent is an insoluble salt of iron, from decomposition of the sulphate in the pores of the wood. Other processes have been used for the same purpose, the most noted of which are Kyan's method by corrosive sublimate; Sir William Burnett's, by chloride of zinc; J. Bethell's, by oil of tar; and Boucherie's, by sulphate of copper. Preservative substances generally act by combining with the albuminous or nitrogenized principles of the wood, and thus retarding or preventing their decomposition. The attacks of insects, and the growth of fungi, are also prevented by these processes; and a durability, far beyond the ordinary, is insured to the wood.]

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3. Mosely, William S., *New Madrid, Missouri.*—Proprietor.

Section of Sassafras (*Sassafras officinale*) and Paw-paw trees (*Uvaria triloba*); from trees two feet in diameter. Section of a wild grape vine, eight inches in diameter, which might be of use for posts.

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4. Brigham, J. H., *Prairie, Jefferson, Louisiana.*—Proprietor.

Section of a wild grape vine.

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5. ——— ———, *California.*

California red-wood, from Humboldt Bay; beautifully curled, waved, and ridged—hard as mahogany.

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6. Saunders, John T. H., *Sibley, Jackson County, Missouri.*—Producer.

Bale of Missouri dew-rotted hemp, raised in Jackson County. Seed sown on May 1st, one and a half bushels per acre, yielded 1,000 lbs. per acre.

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7. Douglass & Beer, *St. Louis, Missouri.*—Dressers and Dealers.

Bale of Missouri dew-rotted hemp.

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8. French, James, 41 *Exchange Place, New York.*—Producer.

Specimens of dew-rotted and water-rotted flax.

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9. West, Joseph, *Eufaula, Barbour County, Alabama.*—Producer.

Upland short staple cotton, grown in Alabama.

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10. Bond, Dr. Samuel, *Green Bottom, Tennessee.*—Producer.

Golden seed cotton.

11. Holladay & Dickey, *Weston, Platte County, Missouri.*—Producers.
Bale of American dew-rotted undressed hemp, grown in Platte County, Missouri, and chiefly used in the West for making bagging and rope for baling cotton. The average quantity of hemp raised to the acre in Platte County is about 800 lbs., and the quantity shipped from there about 3,000 tons *per annum*.

12. Baker, Bell & Co., *Weston, Platte County, Missouri.*—Producers.
Bale of hackled hemp, and coil of *bale-rope* manufactured therefrom.

13. Nailer, Jefferson, *Vicksburg, Mississippi.*—Producer.
Bale of fine staple cotton.

14. Batchelor, James M., *Rodney, Mississippi.*—Producer.
Bale of Mexican short staple cotton.

[This bale is the growth of 1852, and the product of selected Mexican seed of the exhibitor. The plantation on which it was grown is situated about two miles from Rodney, Miss., in the region known as the "Gulf Hills," a section distinguished for producing and preparing a material remarkable for its beauty of color, cleanliness, firmness, and strength of staple.

The lands, as the name "Gulf Hills" implies, are broken, and after long cultivation become much washed and impoverished, but can be in some degree resuscitated by *circling*, and by manures. The native forest consists of poplar, ash, walnut, sassafras, and cane. The undisturbed soil is a deep loam, with a substratum of red tenacious clay. As the soil is exhausted, the planter must improve his cotton seed, in order to enhance the value of the crop as an equivalent for its diminished yield.

The seed used by the exhibitor is the product of seed originally imported from Mexico. It is recommended by its comparative freedom from "rot." This disease particularly infected the "black seed cotton," formerly used in Mississippi; and by it the crops of 1811, 1812, and 1813 were almost destroyed.

This cotton is called *short staple*, to distinguish it from Sea Island Cotton; but it is really a long staple of the short staple variety.]

15. Paice, R. M. S., *Clay County, Missouri.*—Producer. (Agents, Lewis S. Morris & Co., *New York.*)
Bale of hemp.

16. Hunter, John J., *Lexington, Kentucky.*—Producer. (Agents, John MacGregor & Co., *New York.*)
American dew-rotted dressed hemp.

17. Hemingway, Thomas, *Lexington, Kentucky.*—Producer. (Agents, John MacGregor & Co., *New York.*)
American dew-rotted hemp.

18. Pope, John, *Memphis, Tennessee.*—Producer.
Bale of golden seed cotton, and specimens of cotton in the seed.

19. Seabrook, William, *Charleston, South Carolina.*—Producer.
Sample of Sea Island cotton.

20. Hanna, W. & J., *Warren County, Illinois.*—Producer.
Madder.

[The manufacture of any new article, or the cultivation and production of a product in general use, for the supply of which we have heretofore been wholly dependent upon foreign markets, are points of progress in the history of the nation, and demand more than a passing and cursory notice.

Madder, the most important of the dyes used in calico-printing, is obtained from the root of the *Rubia tinctoria*, a plant indigenous to Turkey and Persia, and now cultivated extensively in France and the countries of Central Europe. The value of this madder-crop of France, according to the latest returns, is given at from six to seven millions of dollars per annum. The amount of the crop varies greatly during successive years, so that it is difficult to give exactly the value of the mean crop. According to the *Annales de l'Agriculture Francaise*, a hectare in well-manured ground, and in favorable circumstances as regards temperature, will produce 5,000 kilogrammes of dry roots, while, under unfavorable circumstances, it will not yield more than one-half or one-fourth of this amount. The greatest crops obtained are stated not to exceed 25,000 quintals by measure, and the least from 10 to 12,000.

The supply of madder for the American Print Works is derived principally from France and Holland. The amount imported for the year ending July, 1853, was upwards of 18,000,000 pounds, possessing a value of $1,000,000 to $1,600,000. The whole amount of madder imported during the fiscal years 1845, 1846, into the ports of New York, Boston, Baltimore, and Philadelphia, was 16,804,715 pounds. Of this quantity, 8,092,200 lbs. were derived from France upon the Mediterranean, 5,961,950 from Ireland, and 1,785,387 from England; the balance was imported from Belgium, Turkey, Sicily, and the Spanish Atlantic ports. Within the last two years, various attempts to introduce the cultivation of madder, as a staple crop in the New England and Western States, have been made, and thus far with remarkable success.

At Columbus and Birmingham, Ohio, and at Montague, Franklin County, Massachusetts, and on the Connecticut River, good and profitable crops have been obtained. The madder with which the goods exhibited by the Merrimack Company of Lowell were printed was raised at this last-mentioned locality. In its composition, this madder was somewhat deficient in lime; but this being restored in the dyeing process, the colors became fully equal, if not superior, to the best French madder.

From the experimental trials already made, madder appears to be nearly as certain a crop as any other that can be cultivated in this country. The crop is not an annual one, but requires from two to four years to attain its full maturity. It is entirely exempt from injury from insects, and also from the weather, after the first season's growth. The plant is perfectly hardy—stands frost well, and also heat and drought—excepting that during the first winter after planting there is danger, on some soils, of the ground heaving by frost so as to expose the roots to the air, and cause them to winter-kill as in the case of wheat.

Madder, in the United States, produces little or no seed. In Europe seed is produced, and it has on several occasions been imported and sold in this country, but it is said not to vegetate freely. In France and Holland, the madder-growers, however, do not depend at all upon the seed, but upon the roots, or sprouts. The yield per acre of a three-years crop of madder, in the United States, has varied from 2,000 lbs. to 3,000 lbs. worth 15 cents per pound, and in some instances 18 cents.

The soil best adapted to the production of madder is a deep rich loam, containing a good proportion of salts of lime, this element entering largely into the composition of madder and affecting its quality. The sprouts are placed in small furrows, running three inches deep, and eight to ten feet apart, across the whole field, each plant having about one foot space between the roots. Little care is required for the crop after this, besides occasional hoeing and keeping the field free from grass and weeds. As soon as the plants are twelve or fifteen inches high the tops are to be bent down to the surface of the ground and all except the ends covered with earth. The operation is generally repeated three or four times during the first season, and until the vacant places between the furrows is nearly filled up. The plants, at the end of the third or fourth year, are ready for gathering, which is usually done in the month of September. The roots are then thoroughly washed in a machine, dried, and stacked away. Before grinding and preparing for market, the roots require to be further dried in a sort of kiln, or oven, constructed in the simplest manner. They are then extremely brittle, and can be ground in a grist or bark mill. The ground madder is then packed in casks or barrels, and is ready for market.

The preparation of madder known as *garancine*, which is largely imported from the south of France, is formed by moistening the ground root with sulphuric acid, and afterwards subjecting the same to a boiling heat by means of steam. By this process the coloring principle is altered and improved, and a large proportion of it rendered soluble in water.

Within a comparatively recent period it has also been ascertained that the spent madder, if treated in a similar manner, can be made to yield a considerable quantity of additional coloring matter, equal, for some purposes, to that obtained from the fresh madder. This improvement is one of the most important that has been made in the preparation of dye-stuffs during the last twenty years.

The amount of madder imported into Great Britain during the years 1848, '49, and '50, was as follows: 1848, 22,072,400 lbs.; 1849, 25,472,200 lbs.; 1850, 26,186,100 lbs.

In Russia, the cultivation of madder has been undertaken under Government auspices; and the yearly production is already considerable, though insufficient for the home consumption. Specimens of Russian madder were exhibited at the London Exhibition of 1854.

An indigenous variety of madder grows wild in Florida, in great abundance in the savannahs of the counties of Levy, Marion, and South Florida. It is known as the "Florida Paint Root." The root forms an article of food for hogs, cranes, and various other animals; and so powerful is its coloring principle that the bones, marrow, and to some extent the flesh, become deeply tinged with red.

The "Paint Root" has a top somewhat resembling the ordinary flag, with a root about the size of a man's thumb, of various lengths, running horizontally, near the surface of the ground.]

21. Yeatman, Robinson & Co., *St. Louis, Missouri.*
Coils of *bale-rope*, manufactured by C. L. McGrew & Co., of Lexington, Missouri, from American hemp, used for the purpose of baling cotton. Large quantities are manufactured in Missouri and sold to the Southern markets.

22. Morgan, Wm. James, *Wilmington, Clinton County, Ohio.*—Producer.
Two fleeces of fine American wool.

23. Gillet, Jesse P., *Sharon, Washtenaw County, Michigan.*—Producer.
Four fleeces of Saxony wool and 100 samples of Saxony wool, shorn in 1853.

[Wool is a peculiar variety of hair. Under the microscope, it presents fine transverse or oblique lines, (an inch containing from 2,000 to 4,000,) which indicate an imbricated scaly surface. The *felting* property of wool, and its consequent value for manufactures, depends upon this scaly surface and twisted form.

The under-clothing of most quadrupeds consists of wool, but its quantity is small, and it is hidden by the smooth, coarser, and straighter exterior hair. In the wild sheep (*Ovis ammon and O. musimon*) the woolly variety of hair is developed to excess; and in the domestic sheep this peculiarity has been increased, and the quality of the fleece improved, by crossing the breed, choice of climate, pasture, &c., until its original coarseness has disappeared.

Wool has different kinds and degrees of qualities, which may be divided into two general classes—the one better adapted for carding, the other for combing.

In the examination of wool, the following points are to be considered: The degree of imbrication of the surface, as shown by the microscope; the quantity of fibre developed in a given space of fleece; the freedom of the fleece from foreign matters; the skill and care employed in the "scouring" and other processes of preparation.]

24. Bicknell, James, *West Aurora, Erie County, New York.*—Producer.
Three samples of wool of extraordinary length—
No. 1, 36 inches long, growth of six years.
No. 2, 32 inches long, growth of four years.
No. 3, 18 inches long, growth of two years.

[The sheep from which these were taken were all ewes, and were bred by the exhibitor upon his farm. Their weights were severally as follows:—No. 1, 275 lbs.; No. 2, 330 lbs.; No. 3, 290 lbs.; and the weight of the fleeces, No. 1, 30 lbs.; No. 2, 35 lbs.; and No. 3, 18 lbs.]

25. Gough, Hoag & Lawrence, 71 *Pine St., New York.*—Agents.
Fleeces of Saxony wool, grown in Duchess County, New York.

26. McFadden, John, *Harrison County, Ohio.*—Producer.
Superfine American wool, in the fleece.

27. Allston, R. F. W., *Pee Dee River, South Carolina.*—Producer.
Merino wool.

28. Wood, Thomas, *Ohio.* (Agent, M. W. Cooper, 53 *Exchange Place, New York.*)
Various fleeces of wool.

29. Vail, William, & Co., *New Market, New Jersey.*
Bale of oakum.

30. Miller, Harris & Co., *New Orleans.* (Agent, John G. Miller, 83 *Water St., New York.*)
New Orleans long moss (*Tillandsia usneöides*), for upholstery purposes.

[The Tillandsia is one of the numerous examples of air plants which fix themselves upon the trees of southern and tropical countries and obtain their support from the moist air. It is not a moss, but one of the family of plants called by botanists *Bromeliaccæ*, to which the Pine-apple belongs. It possesses considerable elasticity, and is prepared as a substitute for horse-hair. Naturalists use it for stuffing birds.]

31. Russell, Stiles & Hibbard, *New York.*—Manufacturers.
Extract of logwood, which gives a dye equal to that given by logwood itself.

32. Gerker & Beekler, *Philadelphia, Pennsylvania.*—Manufacturers.
Glue and isinglass.

33. Sanger, Augustus H., *Danvers, Massachusetts.*—Manufacturer.
Samples of glue.

34. Mixer & Gilbert, *Boston, Massachusetts.*—Manufacturers.
Spermaceti candles.

35. Rowe, T. G. & A. L., 188 *Front St., New York.*—Manufactured at *Montauk Mills, Brooklyn, New York.*
Linseed oil, made light-colored without bleaching, and especially adapted to painting and varnishing purposes.

36. Guerrier, H., 59 *Warren St., New York.*—Manufacturer.
Extract of saffron.

37. Weiss, Frederick William, & Co., *West Mount Vernon, Westchester Co., New York.*—Manufacturers.
Glue, of three varieties, one of which is white, and quite free from any offensive odor, being therefore suitable for the use of bookbinders, paper-hangers, frame-gilders, card-manufacturers, &c.

38. Wilbur, William, & Co., *New Orleans, Louisiana.*—Manufacturers.
Cotton-seed oil, and soap made from it.

[Cotton-seed oil has been produced in Egypt, France, England, and the United States, but not on a large scale and for commercial purposes. Each pound of ginned cotton yields three pounds of seed, the total amount in the United States being 3,600,000,000 lbs. One-half being retained for planting, there remains 1,800,000,000 lbs. which might be manufactured. 100 lbs. of cotton seed will yield 2 gallons of oil, 48 lbs. of oil-cake, and 6 lbs. of soap-stock; the total estimated value is about $35,000,000, no appreciable part of which is at present realized. The specimens of cotton oil prepared by the exhibitor, were used on the machinery in the Crystal Palace, and found to possess excellent lubricating qualities. Soaps of every variety are made from it, and in New Orleans it has been used, with commendation, as a substitute for the Italian olive oil.]

38a. Sizer, Henry, *New York.*—Agent.
Lubricating oil, for machinery.

38b. Knight, Isaac D., *Philadelphia, Pennsylvania.*—Proprietor.
Lubricating oil, for machinery.

38c. De La Vergne & Yockney, *New York.*
Machine oil.

38d. Rayner & Gillman, *New York.*—Manufacturers.
Machine oil.

38e. Priest, James H. R., 585 *Broadway, New York.*
Machine oil.

39. Farncrook, Henry, *Elbridge, New York.*—Inventor and manufacturer.
Variously colored cements for wood, glass, marble, earthenware, &c.

40. Mears, Granville, *Boston, Massachusetts.*—Manufacturer.
Refined lard-oil, bleached and unbleached.

41. Miller, A., & Co., *Newbern, North Carolina.*—Manufacturers.
Specimens of rosin oil.

42. Frank, F., *Cincinnati, Ohio.*—Manufacturer.
Lard oil.

43. Cuthbert, John H., 168 *Fulton St., New York.*—Agent.
Munsell's refined drying oil for artists' use.

44. Rowley, Ashburner & Co., *Philadelphia.*—Manufacturers.
Refined rosin oil, three varieties, for the use of painters, for lubricating machinery, and other purposes.

45. Baker, George T., & Son, *New Bedford, Massachusetts.*—Manufacturers.
Blocks of spermaceti, stearic acid, spermaceti and adamantine candles.

46. Des Brosses, Frederick, *Manhattanville, New York City.*—Manufacturer.
Stearic acid candles, made by the process of distillation with sulphuric acid by steam, by the French process, patented by Messrs. Poisab & Knab.

47. Litchfield & Co., 154 *Front St., New York.*—Manufacturers.
Sperm, sea-elephant, and lard oils, refined for burning and lubricating purposes; also specimens of spermaceti candles, and refined crystalline spermaceti.

48. Salvi, Lorenzo, *Staten Island, New York.*
Stearic acid candles.

49. Glenn & Co., *Cincinnati, Ohio.*—Manufacturers.
Lard oil.

50. Samuel Judd's Sons & Co., 139 *Front St., New York.*—Manufacturers.
Spermaceti and patent candles.

51. Burckhardt & Co., *Cincinnati, Ohio.*—Manufacturers.
Lard oil, made by a purely mechanical process without the use of chemical agents.

52. Lyles, Polhamus & Co., 120 *Front St., New York.*—Manufacturers.
Sperm oil, in the crude, manufactured, and bleached state; specimens of refined spermaceti, in large blocks, splendidly crystallized and variously colored; also busts and figures of various kinds, of the same material, with candles of various colors.

53. Mitchell, R. G. & Co., *New York.*—Manufacturers.
Candles and figures made of stearic acid.

54. Zinsser & Marx, 175 *William St., New York.*—Manufacturers.
Bleached and refined shellac, which gives a colorless, nearly transparent solution in alcohol, used for making sealing-wax and different colored transparent varnishes, varnish for batters, &c.
French alcoholic copal varnishes, which dry quickly and are susceptible of being polished, made from the best East India copal, and adapted to varnishing leather, paper, parchment, oil paintings, horn, whalebone, ivory; for giving color to metals, and protecting them from rust, &c.

54a. Lockwoods & Orvis, *Troy, New York.*—Agents.
Potato starch, used extensively by calico-printers and cotton manufacturers.

54b. Hoyer & Meiners, *Milwaukee, Wisconsin.*—Manufacturers.
Starch, made from prime white winter wheat.

55. Mitchener, J. L., & Co., *Cincinnati, Ohio.*—Manufacturers
Lard oil.

55a. Backes, Louis, *St. Louis, Missouri.*—Manufacturer.
Samples of starch, for manufacturers.

55b. Colgate, William, & Co., 6 *Dutch St., New York.*—Manufacturers.
Pearl starch, manufactured from Indian corn.

55c. Spear, Burke & Co., *Boston, Massachusetts.*—Manufacturers.
Specimens of potato starch.

56. Nix, Arthur, *New York.*
Sun-bleached wax, made from American yellow wax.

57. Stanton & Nevin, 295½ *Pearl St., New York.*—Manufacturers.
Patent adamantine candles, and figure made of stearic acid.

57a. Armstrong, S. J. T., *New York.*—Proprietor.
A series of specimens of the milk of the India-rubber or caoutchouc plants, collected in Brazil, New Grenada, Peru, Nicaragua, Florida, British East Indies, Africa, and prepared so that it may be kept indefinitely in close vessels without coagulating, according to a method discovered in 1852, by H. L. Norris, American Consul at Para, Brazil.
A sheet of India-rubber formed from the prepared milk by evaporation.

GREAT BRITAIN AND IRELAND.

58. Rathbone, John and James, *Dublin.*—Manufacturers.
Specimens of oils.

58A. Wotherspoon, Robert, *Glasgow.*—Manufacturer.
Glenfield patent starch, made from East Indian sago.

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59. Burton & Garraway, *Bethnal Green, London.*—Manufacturers.
Archil, cudbear and extract of indigo in the raw and manufactured states; silks and wool dyed with these preparations, and samples of the lichens from which archil is obtained; also skins, worsteds, and morocco leather and gelatine dyed with archil.

[Archil is a coloring matter prepared from lichens (*Roccella tinctoria* and *R. fuciformis*), found on the coasts of Sweden, Scotland, Wales, &c. The most esteemed comes from the Canaries and Cape de Verde Islands. The colors are known in commerce in the following forms:—

1st. A violet red paste, called archil.

2d. A mass of a drier character, called persis.

3d. A red powder, named cudbear.

To prepare archil, the lichens are ground to a pulp, with the addition of water; the pulp is then put into a closely covered trough, sprinkled with a mixture of urine and ammonia, and left to ferment. In a few days the color begins to develop, and the operation is finished in about six weeks. The product is stored in casks, and is thought to improve by age in the intensity of its color, which should be a deep reddish violet.

Prepared archil readily imparts its color to water, alcohol, and ammonia. Spirit-of-wine thermometers are filled with its alcoholic solution, which slowly loses its color and recovers it again by exposure to the air; the watery infusion in vacuo fades in a few days, and the tint returns on access to the air. It has been found that the coloring principle of archil depends upon the oxydation of a colorless base, existing in the lichen. This base is termed *orceine*, and the oxydized color, *orcine*.

No mordants are required for dyeing with archil. It is not used for cottons, but extensively for silks and woollens. The tints it imparts are very beautiful, but lack permanence. It is also used to give depth and richness to other dyes.]

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60. C. Haynes & Hogg, *Shrewsbury, England.*—Producers.
Raw silk.

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61. Noale, Cooper & Bolton, *London.*
Specimens of English seeds and vegetable productions.

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62. Marshall, John, *London and Leeds.*—Manufacturer.
Marshall's lac-dye, ground; turmeric; indigo; refined indigo; extract of indigo; indigo carmine; blue and red archil.

[Indigo is obtained from the leaves of the *Indigofera tinctoria*. The process of dyeing with indigo consists in depriving it of a portion of its oxygen. It then assumes a green color, is soluble in water, and enters the pores of the cloth immersed in the solution. When the saturation is complete, it is exposed to the air; the indigo re-absorbs oxygen, and recovers its original color and stability. Mixed with a yellow dye, it produces green.

Lac-dye is the coloring matter of "lac," a substance produced on the branches of various trees in the East Indies, by the puncture of an insect, called *Coccus lacca* or *C. ficus*. The resinous matter separated from lac forms the "shellac" of commerce; the lac-dye is a watery infusion of the ground stick-lac, evaporated to dryness, and made into little cakes two inches square and half an inch thick. It is employed for dyeing wool and cloth scarlet, but is inferior to cochineal.

Turmeric is the root of *Curcuma longa*, a native of India and China. It affords a yellow dye, very brilliant and very fugitive. It is occasionally used to give a peculiar tint to greens and light browns. Its coloring principle is called *curcumine*. Paper dyed with turmeric, and kept in close vials, is much used as a test for alkalies, which change it to reddish brown.]

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63. Fenton, Son & Co., *Belfast, Ireland.*—Manufacturers.
Samples of flax in various states of manufacture, and of the flax plant and seed.

63A. Royal Commissioners of the London Exhibition of 1851.
Collection of examples of British productions selected from the Exhibition of 1851 by the Royal Commissioners, and presented by them to the United States. The names of the producers are given with the samples.

1. Simpson, Humphrey & Vickers.—London.
Isinglass, cut and uncut.

2. W. Dufaville.—London.
Crystallized fish gelatine; machine-cut British fish-isinglass; calf-gelatine, 1st and 2d qualities.

3. Samuel Berger & Co.—Bromley, Middlesex.
White and blue patent rice-starch.

4. Robert Burn.—Edinburgh.
Cotton-seed oil and oil-cake.

5. David and William Miller.—Musselburgh, Scotland.
Household white starch; bleachers' wheaten starch; royal patent starch, for laundry use; royal blue starch; sago starch; Scotch farina made from potatoes, Nos. 1 and 2.

6. Brown & Polson.—Thrusheraig, near Paisley.
Patent wheat starch; sago-powder starch; pulverized farina from diseased potatoes.

7. McGarry & Sons.—Dublin.
Rape oil and oil-cake; linseed oil and oil-cake.

8. J. & J. Colman.—London.
Cake and lump blue; blue satin-glaze rice and wheat starch; British gum

9. Robert Wotherspoon.—Maxwelton, near Paisley.
Glenfield patent powder-sago starch.

10. J. Cox.—Edinburgh.
Superfine sparkling gelatine; superfine long Scotch glue.

11. Wood & Bedford.—Leeds.
Blue and red cudbear; archil paste; blue and red liquid archil; liquid ammonia, sp. gravity 88°.

12. William Brotherton & Co.—Wandeworth, near London.
British rape seed; raw and purified rape-seed oil.

13. John M. Taverner.—London.
Refined spermaceti.

14. Henry Penney.—London.
Pure bleached linseed oil; pure copal varnish; black Japan varnish; pale gold size.

14. A. Markwick & Co.—London.
Patent epithem, 1st and 2d, for applying heated fluids to the surface of the body.

15. W. Watt & Son.—Dumfries.
Glue, made from refuse pieces of hides and skins, for joiners' use.

16. Abbott & Wright.—Suffolk.
Crown glue, manufactured from hides and feet of cattle.

16. Bevington & Sons.—Bermondsey, London.
Materials used in England for tanning and dressing hides and skins.

17. Benjamin & Smith.—Newtown, London.
Oxalic acid; oxalate of potash; emerald green; Chinese red; chrome yellows; zinc yellow; Brunswick greens; celestial blue.

18. Benjamin Smith & Son.—Spitalfields, London.
Samples of archil and cudbear, and the lichens from which they are produced.

19. David Cahn.—Finsbury, London.
Ivory black for copper-plate, lithographic, and letter-press printers.

20. J. C. and J. Field.—Lambeth, London.
Stearine produced from tallow.

21. William Andersen Rose.—London.
Painting materials.—Dry and ground white lead; dry and ground white zinc; ground chrome yellow; ultramarine; vermilion; raw, refined, and boiled linseed oil; wood-stain and varnish; clarified machinery and burning-oils; neat's-foot oil; patent black for preserving iron-work; refined vegetable oil; palm-oil grease; antioxyd paint for protecting iron and wood; creosote for preserving timber; liquid and white grease; collection of carriage varnishes.

22. Edward Rea.—London.
Ruby and orange seed-lac; shell-lac garnet; lump dragon's blood; frankincense; gum animi; gum damar; Canada balsam.

23. John Marshall.—Leeds.
Red turmeric; red and blue archil liquor; red and blue archil paste; extract indigo; ground lac-dye; Persian cudbear, red and violet.

24. George Mason.—Yately, Hants.
Flax of 1st and 2d qualities.

25. Preston & Co.—(Belfast Flax Improvement Society), Belfast.
Prepared flax.

26. John Adams.—Coleraine, Ireland.
Flax grown in Ireland.

27. Edward Davy.—The Parks, Devon.
Carded flax prepared from flax straw unsteeped, unretted, or unsteamed.

28. George Mannings.—Wedhampton, Wiltshire.
Diamond clothing wool from Southdown fleeces.

29. J. G. Rebow.—Wivenhoe Park, Essex.
Southdown sheep's wool.

30. C. Derrien.—Sennicots, near Chichester, Sussex.
Merino wool, from two-year-old sheep, sufficiently long and fine for shawl manufacture.

31. Robert Millner.—Dublin.
Fleece of wether, grown in County Meath; fleece of hegget, grown in County Wicklow.

32. Frederick Puckridge.—Kingsland, London.
Goldbeaters' skin; gold and silver cloth; flexible gold and silver cloth.

33. John Bethell.—Westminster, London.
Creosote and specimens of Scotch fir prepared with it, and unprepared.

BRITISH COLONIES—CANADA.

64. Pecquet, M., *Quebec District, Canada East.*—Producer.
Flax seed and dressed flax.

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65. Joly, G., *Lotbinière, Canada East.*—Producer.
Samples of vegetable fibre prepared from the "Cottonier," or wild asparagus of Canada, believed to be of importance as a substitute for flax or hemp.

66. McFarlane, Arch., *Montreal, Canada East.*—Manufacturer.
Samples of glue.

67. Fisher, James, *Rivière des Prairies, Canada East.*—Producer.
Seed of Camelina sativa, or *gold of pleasure*, commonly called "Siberian oil seed."

68. Overell, E., *Quebec.*—Manufacturer.
A pine board, 8 feet × 28 inches × ¼ an inch.

69. Parker, William, & Co., *Huntersville, Canada East.*—Manufacturer.
A pine plank, 12 feet × 38½ × 2 inches.

70. Couture, Madame, *St. Ambroise, Canada East.*—Producer.
Tuscan straw, bleached and unbleached.

71. Tetu, C. H., *Rivière Ouelle, Canada East.*—Manufacturer.
Patent porpoise leather oil, patent seal oil, patent whale oil and dog-fish oil.

BRITISH COLONIES—NEWFOUNDLAND.

72. Dearin, I. J., *St. Johns.*
Codfish, seal, and other oils; dried sarsaparilla and snake roots.

73. Dillon, Walter, *St. Johns.*
Prepared codfish oil.

74. Stewart, J. & W., *St. Johns.*—Manufacturers.
Seal oil.

[The seal fishery is now the most profitable branch of trade in the colony of Newfoundland. Twenty-five years since, about 50 vessels, of 50 or 60 tons each, were engaged in it; in 1852 it employed 367 vessels, of 35,760 tons aggregate tonnage, and 13,000 men. The vessels are from 75 to 200 tons; but those of 130 tons, which carry crews of 40 or 50 men, are preferred. The voyage is begun early in March, rarely exceeds two months, and is often completed in three weeks. Two and three voyages are sometimes made in one season.

The species of seal which chiefly resort to the Newfoundland coast are the Hood Seal (*Stemmatopus cristatus*) and the Harp Seal (*Phoca grœnlandica* and *oceanica*). They whelp their young in January and February on the ice-fields of Labrador. The whelping ice, as it is called, is floated southward by the ocean currents, and is always to be found on the coast of Newfoundland after the middle of March. The young seals not taking to the water until they are three months old, are easily killed; their skins with fat attached are stripped off, and the worthless carcasses are left on the ice. A majority of the vessels secure from 3,000 to 9,000; they are sorted into four qualities; young harp, young hood, old harp and bedlamer (year-old hood), and old hood, the most productive being young harp.

At St. Johns, the headquarters of the trade, the skins and blubber are separated, and the latter is put into wooden cribs, beneath which are wooden pans to catch the oil No artificial heat is used in this process. The oil which runs for the first two or three months is termed *pale seal oil*, and forms 50 to 70 per cent. of the whole quantity. As putrefaction takes place, the oil becomes darker and more offensive. The putrescent refuse and the clippings of the pelts yield further quantities of oil (*boiled seal oil*) by boiling. This old process is being superseded by a steam apparatus invented by S. G. Archibald, of St. Johns. By this invention a uniform and much better quality of oil is produced, free from the horrible odor of that prepared by the old method, and the time required is only twelve hours, instead of six months.]

BRITISH COLONIES—GUIANA.

75. Mansfield, John, *Demerara.*—Collector.

A collection of transverse and vertical sections of woods, for building and other purposes, from Demerara river.

1. Eturewici; transverse and vertical section.
2. Courahalli; transverse and vertical section.
3. Silverballi, or Siruaballi. Yellow; transverse section.

[This wood is supposed to be derived from a species of *Nectandra.* It is light, and floats, and contains a bitter principle, which protects it from the attack of worms. Hence it is much used for the outside planking of colony crafts; specimens are often seen which have formed parts of the bottom and planking of vessels in the Demerara river for more than thirty years. It is also used for booms and masts. It grows to a great size, but then is often hollow; it will, however, square sound from 10 to 14 inches, from 40 to 50 feet long.]

4. Arrakadaca; transverse and vertical section.
5. Coutaballi; transverse and vertical section.

[The tree which yields this timber grows upon sand hills; the wood is very hard and durable, if not exposed to the weather. It is abundant, and principally used for house frames, and will square 12 inches, from 30 to 40 feet long.]

6. Coorarunikika; transverse and vertical section.
7. Etoure, Wallaba; transverse section.

[It has similar properties to Wallaba, but is of smaller size and finer grain.]

8. Aroumatta: transverse and vertical section. Excellent for planking vessels.
9. Hymoracushi; transverse and vertical section.
10. Cururuburari; transverse and vertical section.
11. Hooruwassa; transverse section.
12. Morabuci; transverse and vertical section.
13. Itikitibouraballi (*Machœrium Schomburgkii, Benth*); transverse section.

[The trunk grows to the length of from 30 to 40 feet, and squares from 12 to 16 inches. It is chiefly used for cabinet work. Its purple flowers have the odor of violets.]

14. Coomaruballi; transverse and vertical section.

[A tough wood of small size, used as framing timber.]

15. Manie, or Manne; transverse and vertical section.

[Wood hard; used for staves, &c.]

16. Mooraballi; transverse and vertical section.
17. Wadaduri, or Wadadura, or Monkey-pot tree (*Lecythis grandiflora, Aubl.*); transverse section.

[A close-grained, tolerably hard and heavy wood, presenting, however, numerous open cells; heart-wood, bright amber yellow—recent layers narrow and white. The wood is plentiful, and is used for furniture, staves, &c.]

18. Mora; transverse and vertical section.

[The tree (*Mora excelsa, Benth,*) producing this wood frequently reaches a height of more than 100 feet. It is tough, close, and cross-grained, and is peculiarly adapted for ships' timbers and planks, for which purpose it is extensively used. The trunk of this tree when of the height of from 40 to 50 feet, will square from 18 to 20 inches, but when grown to that size is generally faulty. It grows abundantly on barren sand reefs, and is also plentiful on the banks of some of the rivers. Sir Robert Schomburgk states of the Barima, that in "lieu of palms, the most stately mora trees overshadowed the river. In all my former travels in Guiana, I have nowhere seen trees of this description so gigantic as on the land adjoining the Barima at its upper course. Indeed, frequently, when our boat rounded some point which the river made in its course, and a long reach was before, these majestic trees appeared in the background as hillocks clothed with vegetation, until a nearer approach showed our mistake; and we found that what we considered to have been a hillock, was a single tree, rising to the enormous height of 130 to 150 feet, forming by itself, as it were, a forest of vegetation. The importance of the mora in naval architecture is now fully recognized in Great Britain, and a new export trade has been opened to the colony. On the upper Barima, this tree is so abundant, and grows to such a size, that the whole British navy might be reconstructed merely from the trees which line its banks—a circumstance well worth consideration, for the river being navigable to vessels of twelve feet draught, the craft intended for the transport of the timber might load at the very spot where the trees are cut down.]

19. Simaruba, or Sumaruppa (*Simaruba officinalis; S. amara, Aubl.*); transverse and vertical sections.

[It resembles White Pine in color and quality, and makes good boards for joiners' work.]

20. Suradanni, or Seridani; transverse and vertical sections.

[A moderately hard, rather heavy, but not even-grained wood. The sap-wood is not perceptibly lighter in color than the heart-wood. It is much used for timbers, rails, and covering boards for colony craft, and for naves and felloes of wheels; it is also made into canoes by the Indians. It squares from 14 to 18 inches, from 30 to 40 feet long.]

21. Doori; transverse and vertical section.
22. Curahuri, or Carahura; transverse and vertical section.
23. Wallaba (*Eperua falcata, Aubl.*).

[A tree very abundant throughout the colony. It is hard, splits freely, and is very durable from being impregnated with a resinous oil. It is used for house-frames, palings, shingles, staves, &c. It has been ascertained that a roof well shingled with this wood will last upwards of forty years. It may be had from 15 to 20 inches square, and from 30 to 40 feet long.

The taconba, or heart of the upper portion of the trunks of Wallaba trees, which have been felled in the forests, and from which the sap-wood has decayed, is much used for paling posts and other out-door purposes, being found to be almost imperishable. It is about to be used as sleepers on the Demerara Railway, for which purpose it will probably prove well adapted. The defect of this wood is its inability to bear great lateral strain; it should not therefore be used for beams longer than 12 feet. Sir R. Schomburgk states that the wood is deep red, frequently variegated with whitish streaks, hard, heavy, and shining.]

24. Bannia, or Ebony; vertical section.

[This grows from 20 to 30 feet high, attains a large size in circumference, but is almost always hollow or faulty, so that no large piece can be got out of it; it is very hard, and is used for walking-sticks, inlaying work, veneering, &c.]

25. Uriballi, or Eurebally, or Guiana mahogany; vertical section.

[The wood of a large tree, excellent for planking craft and making wardrobes, as neither worms nor moths will attack it.]

26. Tataba, or Tatabo; transverse section.

[Excellent for flooring and partitions; it grows from 40 to 60 feet high, but is scarce.] See No. 95.

27. Hyriballi, pale; vertical and transverse section: brown, vertical and transverse section.

28. Turanira, Towranero, or Bastard Bully tree; transverse section.

[A fine, close, even-grained, hard, heavy wood. It is very plentiful, and is used for framing timber, spokes, &c. It will square 25 inches, 40 to 50 feet long.]

29. Waremia; transverse section.
30. Youquadanni; transverse section.
31. Sarabadanni; transverse section.
32. Carrasari; transverse and vertical section.
33. Barramalli; transverse and vertical section.
34. Wiaballi; transverse and vertical section.
35. Cooracooruli; transverse and vertical section.
36. Silbadani, or Sibadanni; transverse section.

[A fine, close-grained, moderately hard, and rather heavy wood; the bark smooth, resembling that of common beech. It is used for furniture.]

37. Hicka; transverse section.
38. Moraballi; transverse section.
39. Arewa; transverse section.
40. Coolicishiri; transverse and vertical section.
41. Saouari, or Souwarri; transverse section. (*Caryocar tomentosum, Dec.; Pekea tuberculosa, Aubl.*)

[A coarse, open-grained, hard, heavy wood. The tree which yields the delicious nut known as the Saouari or Sewarri. The wood greatly resembles in its properties the Mora, being excellent for ship-building, mill-timbers, and planks. It may be had from 16 to 20 inches square, from 20 to 40 feet long.]

42. Manabadieu; transverse section.
43. Hyawa, or Incense-tree (*Icica heptaphylla, Aubl.*); transverse section.

[A light, though rather fine, close-grained, white wood; large and buoyant, and proof against the attacks of worms. The gum hyawa is obtained from this tree.]

44. Awasaculi; transverse section.
45. Waremiaballi, transverse and vertical section.
46. Aradanni; transverse and vertical section.

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76. Cartwright, H., *H. M. Penal Settlement Essequibo.*—Collector

47. Fucaddi; transverse section.

[A soft, tough wood; plentiful, growing from 10 to 12 inches in diameter.]

48. Waddadura, Waddauri, or Monkey-pot; transverse and vertical section. See Number 17.

49. Manniballi, Mannaballi, or Candle-wood; transverse sections.

[This grows from 6 to 10 inches in diameter, very straight, from 30 to 35 feet long, and makes good framing-wood. It is from a variety of this tree that the Indians procure the wax (*curi-manni*) with which they fasten the various parts of their hooks, arrows, &c.]

50. Silbadanni; transverse and vertical section. [See Number 36.]
51. Heobudi, Ubudi, or Wild Cashew; transverse sections.

[A common soft wood, good for inside-work or boards. It grows to a very large size, and is said to bear only once in every four or five years. The fruit is much the same in appearance as the cultivated cashew, but is a little smaller, of a pale yellow or deep puce color, with a pleasant acid taste.]

52. Banya, Bannia, or Ebony; transverse section. [See No. 24.]
53. Urehe; transverse and vertical section.

[A hard wood, growing long and straight, from 6 to 12 inches in diameter; a good framing-timber.]

54. Siraballi, or Silverballi, white variety; transverse and vertical section: brown variety, see Number 3.
55. Abuckka-Abucka-Danui; transverse section. [A small framing-wood.]
56. Baramalli, or Pump-wood; transverse section.

[A soft wood, growing to a large size, formerly used for staves of sugar-hogsheads. The Indians and wood-cutters use the bark to floor and inclose their houses.]

57. Turanira, Towranero, or Bastard Bully tree; transverse section. [See No. 38.]
58. Wooralli; transverse section.
59. Yaruri, Yarooroo, or Paddle-wood; vertical section.

[This wood is obtained from *Aspidosperma excelsum, Benth.*

The whole tree, from 5 to 6 feet in diameter, and to the first branches, about 50 feet in length, has the appearance of being fluted, or as if it consisted of a fasciculus of numerous slender trees. The fluted projections of the trunk are used by the Indians for the construction of their paddles. The wood is elastic, very strong, and preferred to any other for cotton-gin rollers. It is light, and not apt to splinter, and might on account of its lightness be employed for floats of paddle-wheels of steam-vessels.]

60. Souari, Sewarri, or Sewarra; transverse section. [See No. 41.]
61. Coutaballi; transverse section. See No. 5.
62. Hooriwassa, or Soap-wood; transverse sections.

[It grows from 30 to 40 feet high, is soft, makes good boards and heading for sugar-hogsheads. The root and bark are used by the Indians as soap.]

63. Greenheart, or Sipiri; transverse section.

[The Greenheart-tree (*Nectandra Rodiæi, Benth.*) is very abundant, and its timbers, squaring from 18 to 24 inches, can be procured without a knot from 60 to 70 feet long. It is a fine-grained, hard wood, well adapted for planking of vessels, house-frames, wharves, bridges, and other purposes, where great strength and durability are required. Mr. Manifold, Engineer of the Demerara Railway, states that this is the best timber for resisting tensile and compressive strains, and is therefore well adapted for keelsons for ships, and beams of all kinds. It is a very heavy, but not even-grained wood; the duramen is deep brown, the recent layers broad and pale yellow.]

64. Aramatto; transverse section.
65. Carapa, or Crab-wood; transverse and vertical section.

[This wood is obtained from *Xylocarpus carapa, Spreng.*, or *Carapa Guianensis, Aubl.*, the seeds of which yield the crab-oil. It is a light wood, takes a high polish, and is used for masts, spars, floorings, partitions, and doors of houses. There are two varieties, the red and white. It squares from 14 to 16 inches, from 40 to 60 feet long. It is a tolerably hard, even-grained wood, and is in great repute in the colony for interior work.]

66. Mora; transverse section. See No. 18.
67. Simiri, or Locust; vertical section.

[A rather open-grained, though hard, heavy wood. The tree producing this wood is *Hymenæa Courbaril, L.*, and is plentiful in various parts of the colony. It often attains a height of from 60 to 80 feet, with a trunk from 7 to 8 feet in diameter. The wood is hard and compact, and its durability recommends it for mill-rollers and similar purposes. The Indians make "wood-skins" of the bark. See No. 123. From this tree is obtained a gum, Gum Anime, used often for the same purposes as gum copal.]

68. Purpleheart, or Mariwayana; transverse section.

[The Purpleheart has a hard and heavy, though open-grained wood; the duramen, in longitudinal section, is bright claret; in transverse section, deep-brown purple; the recent layers narrow, and pale yellow. This tree (*Copaifera pubiflora*, or *bracteata?*) yields a timber of great strength, durability, and elasticity, and is described by Dr. Lindley as "invaluable for resisting the shock of artillery discharges, on which account it is used for mortar-beds." It is used for windmill-shafts, rollers, and machinery. It has also been suggested by a practical ship-builder that this wood, if better known, would be likely to take the place of rose-wood in the ornamental work of ship's cabins, &c. It is plentiful and very large; the bark is used by the Indians to make "wood-skins," or canoes. Like the Greenheart, the Purpleheart belongs to the natural order *Fabaceæ*. In addition to its timber, it is valuable for the quantity of balsam which gushes from the bark on being wounded.]

69. Epcripessi; transverse section. [A hard, good, small wood for framing.]
70. Small Monkey-Pot; transverse section. (*Lecythis parviflora, L.*)

[A soft wood, not much used, but growing to great size.]

71. Amooroo; transverse section.

[A species of the Black Yarri-Yarri, or Lance-wood. It is seldom larger than 5 or 6 inches in diameter, but is streng and elastic; it is used for Logie spars, beams, &c. See No. 83.]

72. Hubaballi, or Hoobooballi; transverse section.

[This wood is very close and fine-grained, is easily worked, takes a high polish, and is much used in the colony for furniture; it makes extremely handsome bedstead posts. It may be had from 15 to 20 inches square, 40 to 70 feet long. The wood is heavy and hard; the duramen is deep-red chestnut; the alburnum, nut-brown.]

73. Alsouroo; transverse and vertical section.

[A hard wood, plentiful on the banks of rivers, but not much used.]

74. Acuyuri palm; transverse and vertical section. (*Astrocaryum aculeatum, Meyer.*)

[The outside or woody part of the stem takes a fine polish, and is used for cabinet work, walking-sticks, &c. It bears a fruit about the size of a hen's egg, containing a large seed covered with a pulp, from which a bright-yellow oil is obtained. Both pulp and oil are edible.]

75. Uriballi; transverse section. See No. 25.
76. Buruch, Bully or Bullet tree; transverse section.

[A fine, close-grained, moderately hard, and rather heavy wood. The tree yielding this wood is supposed to be a species of *Mimusops*. It is found throughout the colony, but most abundantly in the county of Berbice. It is of great size, squaring from 20 to 30 inches, 20 to 30 feet long. The weather has little effect upon it, and it is employed for house-frames, posts, floors, &c. The upper portion of the trunk and the branches are manufactured into shingles, wheel-spokes, palings, &c.]

77. Wooralibali; transverse section. [A cross-grained red wood; very scarce.]
78. Lara-coo-sana, or Bastard Yaruri; transverse and vertical section.

[It grows to a great size, the fluted projections being sometimes as broad as 8 or 9 feet. It is used for the same purposes as No. 59.]

79. Kewarroe-Cusi; transverse section.

[A hard wood, of a bright-yellow color; not much used.]

80. Carra-Seri, or Black Lance-wood; transverse section.

[This seldom grows larger than 5 or 6 inches in diameter, and is remarkable for growing with but little taper. The specimen sent is larger than usual; it is strong and elastic, making superior spars and beams.]

81. Waari; transverse and vertical section.

[A large tree, with cross-grain, and exceedingly tough; used by the Indians for making canoes, &c.]

82. Sirabully-Bally; transverse section.

[A small, very hard wood, fit for framing.]

83. Yarri-Yarri, or Lance-wood; vertical section.

[A light, yet fine, close-grained, and tolerably hard wood. This tree is stated by Schomburgk to be *Duguetia quitarensis, Lindl.* It is a slender tree, found in tolerable

abundance in the interior of the colony. The wood possesses much toughness and elasticity, and is used for gig-shafts, and, when small, for whip-handles and fishing-rods. The Indians make their arrow-points of it. It grows from 4 to 6 inches in diameter at the lower end, and from 15 to 20 feet long.]

84. Youraballi; vertical section.

[It is a small tree, 3 or 4 inches in diameter, but is very strong, and is frequently used for the pin by which timber is hauled out of the bush.]

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77. Buchanan, A.—Collector.

A collection of woods from Massarooni river.

85. Washiba, or Indian Bow-wood; transverse and vertical sections.

[A very durable, elastic, and strong wood; used for windmill-shafts and spindles. The specimens of vertical section were taken from the branch of a tree 100 feet from the ground; the age must be computed by centuries. Scarce.]

86. Cabacalli; transverse and vertical section.

[A fine, close-grained, moderately hard, and rather heavy wood. This wood is impregnated with a bitter principle, which defends it against worms; it lasts well under water, and is much used for planking colony craft; it must, however, be fastened with copper nails. It will square from 12 to 16 inches, or even more; from 40 to 50 feet long. Specimens are from a young tree. Not plentiful.]

87. Cucadi; transverse and vertical section.

[Durable, tough, and difficult to split. The tree might be from 70 to 90 years old. Not plentiful.]

88. Couraballi; transverse and vertical section. [A young tree. Scarce.]
89. Sun-wood; transverse and vertical section. [Furniture-wood. Very scarce.]
90. Camara, or Touca; transverse and vertical section.

[A fine, close-grained, hard, and very heavy wood. It is obtained from *Dipteryx odorata, Willd.*, the tree which produces the well-known Tonquin Bean. It is tough, and durable in an eminent degree, and it is said that a portion of its timber, one inch square and of a given length, bears 100 lbs. more weight than any other timber in Guiana of the same dimensions. It is, therefore, peculiarly well adapted for any purpose where resistance to great pressure is the object, and for shafts, mill-wheels, or cogs. It squares from 18 to 20 inches, from 40 to 50 feet long. Not plentiful.]

91. Koquerettcballi; transverse and vertical section.

[A hard and tough wood, forming excellent rafters and beams for cottages. It grows from 20 to 30 feet long, and from 4 to 6 inches in diameter.]

92. Suradanni; transverse and vertical section. [See No. 20.]
93. Siruaballi, white; transverse and vertical section. [See No. 3.]

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78. Outridge, John.—Collector.

A collection of sections of woods from Demerara river.

94. Camara, or Tonca; transverse section. [See No. 26.]
95. Tataba, or Tatabo; transverse section.

[Used for mill-cogs and rollers. Plentiful. See No. 90.]

96. Torch-wood; transverse section.

[Supposed to be obtained from a species of *Amyris* or *Icica*. When beaten, so as to separate the fibres, the branches are used as torches by the Indians.]

97. Hackia; transverse section.

[This wood, known in the colony as *Lignum vitæ*, is said to be obtained from the *Guaiacum officinale, L.*; but this seems doubtful, as the tree producing this wood attains a height of from 50 to 60 feet, and squares 16 to 18 inches, while the *Guaiacum officinale* is described as a comparatively small tree, about four or five inches in diameter. It is used for mill-cogs and shafts.]

98. Crette; transverse section.
99. Duca; transverse section.
100. Crab-wood; transverse section. [See No. 65.]
101. Serewa; transverse and vertical section.
102. Hymokusi, or Hymora-kusi; transverse section.
103. Siruaballi, or Silverballi. Yellow. Transverse section. [See No. 3.]
104. Sumaruppa; transverse section. [See No. 19.]
105. Ducalliballi; transverse section.

[This grows to a pretty large size, but is not plentiful. The trunk is about forty feet high, but seldom exceeds twenty inches in diameter. The wood is deep red, finer, more equal, and more compact than mahogany, and, like the Ducoballi, is much used for furniture. It takes a high polish, and resembles, or perhaps is identical with, the Brazilian Beef-wood. The specimens sent are the tacouba, or heart.]

106. Wild Spice-wood; transverse section.
107. Kakaralli; transverse section.

[A fine, close, even-grained wood, hard and heavy. Duramen, deep red brown; alburnum, broad, pale, dirty yellow. The wood is very plentiful, and it has been proved that it is more durable than Greenheart in salt water, as it possesses the quality of resisting the depredations of the sea-worm and barnacle. It may be had from six to fourteen inches square. The specimens sent are from a tree supposed to be about twenty years old.]

108. Sahou; transverse section.
109. Sibadauni; transverse and vertical section. [See No. 36.]
110. Hubaballi, or Hoobooballi; transverse section. [See No. 72.]
111. Wadacluri, or Monkey-Pot tree: transverse section. [See No. 17.]
112. Hooraballi; transverse section.
113. Hucouya, or Iron-wood; transverse section.

[This is the produce of a large tree, very hard, but not durable if exposed to the weather.]

114. Wamara, Brown Ebony, or Club-wood.

[A remarkably fine, close-grained, hard, heavy wood. Duramen of a beautiful deep Vandyke brown; alburnum, three inches broad, dirty yellow. This wood is hard and cross-grained, consequently not apt to split, and it would therefore answer various purposes in naval architecture. It may be had from 6 to 12 inches square, and from 40 to 60 feet long. The Indians make their war-clubs of it.]

115. Saka, or Bastard Purpleheart; transverse section.

[A fine, close-grained, hard, heavy wood. Duramen, bright purple; alburnum, dirty white. In brightness of color it excels the real Purpleheart. It is used for furniture.]

116. Coonorubi; transverse section.

[The bark is used by the Indians for staining their war implements. Plentiful.]

117. Manaballi; transverse section. [See No. 49.]
118. Pacaddi; transverse section.
119. Purpleheart; transverse and vertical section. [See No. 68.]
120. Hyawaballi; transverse section.

[A fine, close-grained, hard, heavy wood. This tree is scarce. The wood, known as *zebra-wood*, is used for furniture.]

121. Sumaruppa; transverse section. [See No. 19.]
122. Bartaballi; transverse and vertical section.
123. Sinuri, or Locust-wood. [See No. 67.]

[The specimen sent is part of the frame of a sugar-mill, now in process of erection on Plantation *Versailles*, the property of the Hon. John Croal. This frame contains 1,400 cubic feet of solid timber, and is placed on a foundation of 2,464 cubic feet of solid Greenheart planks, on which brick-work for the mill is erected. The iron rollers are 6 feet 6 inches long, and 3 feet 6 inches in diameter. Weight of the top roller and shaft, 12 tons 4 cwt.; entire weight of iron work, 103 tons 12 cwt.; entire weight of timber, 138 tons.]

124. Greenheart; transverse and vertical section. [See No. 63.]
125. Mora; vertical section. [See No. 18. Contributed by A. Hunter.]
126. Wallaba; shingles of. [Contributed by Chas. Benjamin.]
127. Wallaba; staves made of. [Contributed by Chas. Benjamin.]

[This wood, as described at No. 23, is one of the most valuable woods of this colony for house frames, shingles, and staves for vats; and it answers well for rum puncheons, but for that purpose is not much used when White Oak can be had at a fair price. Nine-tenths of the vats which receive the rain-water from the roofs of buildings, for drinking, washing, and other purposes of this colony, are made of this wood; and a large proportion of those used in distilleries are also made of the same material, and are more durable than any other.

Shingles, such as the bundles sent, can be delivered at the river side, 100 miles from its mouth, at from $7 to $8 a thousand, or of smaller dimensions at a corresponding reduction. Vat staves, such as those sent, are worth at the river side about $80 a thousand.

During the last war between Great Britain and the United States, the neighboring British West India Islands, Barbadoes, St. Vincent, Grenada, and Dominica, were supplied altogether from British Guiana with Wallaba shingles, instead of Cypress, Pine, and Cedar, which they had previously received from the United States.]

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79. Hunter, A., *Demerara.*—Manufacturer.

A table-top, exhibiting 133 specimens of woods, the growth of this colony:—

1. Letterwood.
2. Annedein.
3. Sibadanni.
4. Mooruballi.
5. Satin-wood.
6. Itipiribouraballi.
7. Muraburi.
8. Washiba.
9. Sea-grape.
10. Saouri.
11. Lignum vitæ.
12. Black Greenheart.
13. Purpleheart.
14. Tamarind.
15. Youradanni.
16. Coffee.
17. Sun-wood.
18. Avocado Pear.
19. Silverballi, yellow.
20. Fiddle-wood.
21. Cherry.
22. Red Cedar.
23. Dark Locust.
24. Mora.
25. Determa?
26. Star Apple.
27. Red Locust.
28. Calabash.
29. Wallaba.
30. Soap Berry.
31. Dakuma.
32. Plum.
33. Carraseri.
34. Groogroo.
35. Blackheart.
36. Sapadilla.
37. Logwood.
38. Suradanni.
39. Carrahuri.
40. Etourewiel.
41. Moablte.
42. Covacouralli.
43. Golden Apple.
44. Bullet Tree.
45. Wiaballi.
46. Etoure Wallaba.
47. Tabicushi.
48. Black Hububalli.
49. Hymeracushi.
50. Wallaballi.
51. Coolooeoukiseri.
52. Yarri-Yarri.
53. Silverballi.
54. Gnoseberry.
55. Commaraballi.
56. Ducaliballi.
57. Turanira.
58. Marabaduri.
59. Coutaballi.
60. Yaruri.
61. Arcamatto.
62. Tonquin Bean.
63. Bastard Fustic.
64. Wild Cashew.
65. Curuburari.
66. Coaldamara.
67. Mangu.
68. White Locust.
69. Tataho.
70. Orange.
71. Pale Hydraballi.
72. Curacuralli.
73. Accouriebroed.
74. Cumbadanni.
75. Waremia.
76. Wamara.
77. Simarupa.
78. Guava.
79. Mammee.
80. Almond.
81. Cabacalli.
82. Cedar.
83. Yellow Paddlewood.
84. Itikiribouraballi.
85. Yellow Greenheart.
86. Cucadi.
87. Monkey Apple.
88. Iperipessi.
89. Wild Orange.
90. Coopa.
91. Waremiaballi.
92. Lana?
93. Bannia.
94. Urebe.
95. Baranealli.
96. Serewa.
97. Brown Hydraballi.
98. Hymeracusi.
99. Koqueretaballi.
100. Huwaracusi.
101. Carrasiri.
102. Arradauni.
103. Awassacooli.
104. Hourewassa.
105. Coobaralli.
106. Sand Box.
107. Mannibalii.
108. Iron-wood.
109. Lemon-wood.
110. Uriballi.
111. Seraballiballi.
112. Hackia.
113. Cashew.
114. Tooroo.
115. Kakaralli.
116. Contaballi.
117. Deora.
118. Hyawaballi.
119. Crete.
120. Mannie.
121. Waari.
122. Crab-wood.
123. Courida.
124. Hoobooballi.
125. Curarurebika.
126. Aracadacera.
127. Hika.
128. Arava.
129. Amoura.
130. Wadaduri.
131. Marisiballi?
132. Conrahalli.
133. Serabadanni.

[Among those not before described, are the following:—

Letter-wood. Called by the Indians "Bourra Courra." It is a fine, close-grained, hard, and rather heavy wood, very beautiful; of a bright red chestnut color, with

small rhomboidal black patches, mostly isolated, though occasionally concurrent. It is used for ornamental purposes, especially for picture frames. It never attains a large size. It is obtained from *Brosimum Aubletii; Pœp.* or *Piratinera guianensis, Aubl.*, and is one of the most costly woods. The black spots in the woods have been compared to hieroglyphics, the spotted part being peculiar to the heart, which is seldom more than 12 to 15 inches in circumference. It is adapted for cabinet-work of small size, and for veneering only. From its hardness, it is difficult to work, and is therefore little used.

Black Greenheart. A very hard, fine, close-grained, heavy wood; duramen, deep brown; alburnum, narrow, pale ochre yellow. The timber of this tree is used for ship-building, planks, &c., and is more durable than the common Greenheart.

Coffee-tree. A fine, close-grained, hard, heavy wood, of a beautiful cream-white color throughout, and having the appearance of box, both in structure and growth.

Blackheart. A soft, light wood, good for house frames, and for making furniture. It will square from 6 to 7 inches, from 20 to 30 feet long.

Mammee. (*Mammea Americana, Lin.*) A wood very like that of the Pear tree. It produces the Mammee apple, or wild apricot of South America.

White Cedar. (*Warracoeri. Icica altissima, Aubl.*) An open-grained, soft, light, white wood, easily worked, and very aromatic. Sir Robert Schomburgk states, that one of his canoes, 42 feet long and 5½ feet wide, was made from a tree of this species. It is used for oars and paddles, and for boards for inside work of houses. During the American War, it was used for staves for sugar hogsheads.

Determa. A rather hard, but not very close or even-grained wood; the most valuable of the British Guiana woods for ship-building purposes, where it is chiefly used for the bottoms of vessels. It is used also for masts, booms, and planking for colonial craft; and as insects do not infest it, it is well adapted for chests, wardrobes, &c. It will square from 14 to 16 inches, from 40 to 60 feet in length.

Courida. (*Avicennia nitida, Jac.*) An open-grained, moderately soft, and rather light wood. It is a tree of surprising rapidity of growth. The wood is perishable when exposed to the atmosphere, but is very durable under ground, and is therefore used in the foundations of buildings.

Lana. (*Genipa Americana, Lin.*) A fine, close-grained, moderately hard, and rather heavy wood. The bark resembles that of the Birch. The fruit yields the Indian pigment, known as Lana dye. The tree is very high, and the trunk will frequently square from 14 to 18 inches. The wood is not liable to split.

Marisiballi. An exceedingly close-grained, hard, heavy wood. The tree is plentiful, and is mostly used for spars. It will square from 13 to 14 inches, from 30 to 40 feet long.

Satin-wood. Said by Aublet to be yielded by the *Ferolia guianensis*, which has both white and reddish wood, both satiny in appearance. The wood is close, not so hard as box-wood, but resembling it in color, though rather more orange; some pieces are beautifully mottled and curled. It was formerly much in vogue for inside decoration and furniture. It is now used for turning, and the finest specimens are cut into costly veneers. It has an agreeable scent, and is sometimes called "yellow saunders." The Satin-wood of the East Indies is yielded by the *Chloroxylon Swietenia.*

Log-wood. (*Hœmatoxylon campechianum.*) This dark purple wood is generally used as a dyewood. It is occasionally used for turning, and ornamental purposes.

Bastard Fustic. Fustic, properly so called, is the wood of a species of Mulberry, (*Morus tinctoria,*) growing in most parts of South America, the United States, and West Indies; a large and handsome tree. The color of the wood is greenish yellow. Though it is chiefly used for dyeing greens and yellows, it is also employed in turning and mosaic work.

Mango, or *Mangrove*, is a fine, straight-grained, hard, and elastic wood, much used by cabinet-makers for straight edges and squares, as it stands almost as well as Spanish Mahogany. The true Mango is *Rhizopora mangle;* but other trees growing in the same situations are also called by this name, as the *Conocarpus racemosa*, the *Avicennia tomentosa*, and the *sea-side grape, Coccoloba uvifera*, which is a large tree, with wood of a reddish color.

The *Orange* and *Lemon* trees have a wood of yellow color, more frequently used as an article of curiosity than as really useful.

The *Almond-tree*, above mentioned, if properly named, is the *Amygdalus communis.* The wood towards the root is so hard that it is sometimes called false *Lignum vitæ*, and is used for similar purposes.

Iron-wood, so called, is imported from the Brazils, and the East and West Indies. Its colors are very dark browns and reds, sometimes streaked, and generally straight-grained. Almost every country has an iron-wood of its own, so called for its great density. The Iron-wood of Guiana is *Robinia pavacoco, Aubl.*]

Picture-frames, made of thirteen native woods, exhibiting illustrations of Sir Robert Schomburgk's "Views in British Guiana."

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80 Allt, John, *Plantation Belfield, Demerara.*—Producer.

Fibre of Plantain (*Musa paradisiaca*), prepared by scraping the stems with a blunt cutlass, without maceration.

Fibre of the Wild Ochro, or Jumby (*Abelmoschus spec. ?*). This plant is very abundant, susceptible of easy cultivation, and yields its fibre by maceration and beating.

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81. Netscher, A. D. vandea Gon, *Plantation Klein Pouderoyen, Demerara.*—Producer.

Plantain fibre, from stems 6 to 8 months' old.

" " from stems after bearing fruit.

[The Plantain is an annual, herbaceous tree, with an average height of 10 feet and circumference of 30 inches. About 400 suckers are planted to the acre, in squares of 12 by 9 feet. About three-fourths succeed, and give on an average five good plants in two years. An acre yields 300 good and 50 inferior bunches of plantains annually. To obtain the fruit the trees are always cut down, and are usually left to rot, for want of cheap and sufficient machinery to separate the valuable fibre, of which, with its connecting cellular tissue, the stems contain about 10 per cent., the remainder being water, with various salts and tannin in solution.]

Fibre of the Wild Aloe, or Agave (*Agave Americana*).

Cotton, cleaned.

[The specimens of cotton contributed from Guiana are the produce of the *Gossypium arboreum, L.*, and other arborescent and indigenous species. Cotton has long been cultivated by the Indians, who usually have a few shrubs around their huts, and make from them hammocks, which are much valued for their strength and durability. By the colonists cotton has been cultivated only on the coast. In 1803, Demerara and Essequibo exported 46,435 bales of 300 lbs. each; and up to 1820, cotton was the staple of the colony. In 1821, it ceased to be remunerative in comparison with coffee or sugar, and has consequently been in a great measure abandoned, none having been exported for several years. With every advantage of soil and climate, adapted to all the varieties of cotton, the colonists have been quite unable to compete with planters in the United States, who avail themselves of the more regular, efficient, and cheaper labor of slaves, to produce this great staple.]

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82. Laurie, John, *Demerara.*—Producer.

Banana fibre.

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83. Betts, H. C., *Demerara.*—Producer.

Samples of a brown variety of cotton, from the interior of British Guiana.

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84. Blair, Daniel, *Plantation Batavier, Demerara.*—Producer.

Specimens of cotton, cleaned, obtained from wild plants, on a plantation abandoned 27 years since.

Plantation stem, crushed between the rollers of a sugar-mill, and dried to exhibit the mass of fibre.

Mangrove bark (*Rhizophora mangle*), yielding a chocolate-colored dye.

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85. Cullen, John, *St. Roses Mission, Essequibo.*—Producer.

Specimens of silk grass.
Hammock rope.
Mahoe fibre.
Ita Palm fibre.
Prepared arnatto, and its seeds.

[Mahoe fibre is the production of a species of *Hibiscus*, a plant of the Mallow family. It has a coarse, but very strong fibre, and is used for making cordage, coffee-bags, &c.

The Ita Palm (*Mauritia flexuosa, L.*) yields a valuable and abundant fibre, used by the Indians for making hammocks, ropes, &c.]

Hyawai gum, or incense.

[A very fragrant gum, suitable for pastilles, &c., supposed to be obtained from the *Icica heptaphylla.*]

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86. Latorff, W. P., *Demerara.*—Producer.

Fibre of the wild ochro, or jumby.

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87. Greene, H. M., *Demerara.*—Producer.

Specimen of plant yielding silk grass.

[This plant is supposed to be a species of *Bromelia.* Its fibre is very strong, and is used by the Indians to make fish-nets, bow-strings, &c.]

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88. Ross, George, *Demerara.*—Producer.

Arnatto seeds, in their capsules.
Silk grass fibre.

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89. M'Farlane, George, *Demerara.*—Collector.

Wild cotton, or down from the seed vessels of Ipecacuana (*Asclepias curassanica, Willd*).

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90. MacClintock, W. C., *Pomeroon, Essequibo.*—Collector.

Ita Palm fibre, made into twine; Carapa nuts in capsules (*Xylocarpus carapa*); seed vessels of the Monkey Pot (*Lecythis grandiflora*); seed vessels of the Troolie Palm (*Manicaria saccifera*); of the *Mora excelsa;* of the Buck-shot (*Canna sp.*)—from the rhizomas of this plant the *Tous-les-mois* starch of commerce is obtained; seeds of Aenyuri; inner bark of Kakaralli (*Lecythis Ollaria*); seeds of Palm producing vegetable ivory; eaoutchoue; Indian dye; Hyawai gum.

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91. Bagtherson, E. S., *Demerara River.*—Collector.

A series of barks used for tanning, comprising Hooboo (*Spondias lutea*); Souari (*Caryocar tomentosum*); Carapaballi; Itava (*Blakea triplinervea*); Howassicoolli; Yarura (*Aspidospermum excelsum*); Sirada (*Acacia sp. ?*); Crab-wood (*Xylocarpus carapa*).

Kakaralli Gall Nuts (*Lecythis Ollaria*).

Seeds of Cucurite Palm (*Maximiliana regia*); and of Kuru-kururu.

Arnatto, prepared in oil.

[This orange-colored dye is obtained from a small South American shrub, *Bixa orellana.* When its pods are ripe, they burst, and show the seeds surrounded by a splendid crimson pulp, the part which yields the dye. The pulp is fermented in water the seeds separated by beating with paddles, and straining, and the solution boiled in coppers to a paste, which is made into cakes and dried.]

92. Stuchbury, J. S., *Berbice.*—Producer.
Turmeric (*Curcuma longa*).
Laurel oil.
[This oil is supposed to be obtained from the *Oreodaphne opifera.* It is used for affections of the joints, and as a solvent of India-rubber.
Crab oil, obtained from the seeds of the Crab-wood (*Xylocarpus carapa*), is used by the colonists for burning, and as a hair oil.]

93. Knowles, R. J., *Demerara.*—Collector.
Snake nuts.
[This curious production, the fruit of *Ophiocaryon poradoxum*, was discovered by Schomburgk. The embryo of the nut is spirally twisted, and resembles a snake coiled up, whence it has both its scientific and vulgar name.]

94. Lyng, W., *Demerara.*—Collector.
Snake nuts.

95. Mrs. Donald, *Demerara.*—Collector.
Snake nuts.

96. Magill, S., *Demerara.*—Collector.
Spines from trunks of various palms.
Job's Tears (bud-like seeds).
[This singular name is given to the stony seeds of a grass, the *Coix lachryma, L.* They are used in Guiana to make necklaces, and are valued for supposed medicinal qualities.]

97. Mrs. Holmes, *Demerara.*—Producer.
Tonquin beans.
[This bean is the fruit of *Dipteryx odorata, Willd.*, and is chiefly used to give fragrance to snuff.]

98. Holmes, W. H., *Demerara.*—Collector.
Milk from the cow-tree.
[The Hya-Hya (*Tabernæmontana utilis*) grows freely in the forests of Guiana. It is one of the numerous trees of various families which yield a milk-like fluid, in almost all respects, comparable to that furnished by the cow.]

99. Morison, John, *Demerara.*—Producer.
Arnatto seeds.

100. Blair, Mrs., David *Demerara.*—Collector.
Soap-berries.
[These are the kernels of the fruit of *Sapindus Saponaria, L.*; they are used for ornaments.]

101. Hunt, Thomas, *Demerara.*—Collector.
Mimosa seeds.

102. Murray, Henry, *Demerara.*—Collector.
Gum resin of the Locust tree.
[This gum exudes in vertical masses of about a foot in length, from the roots of *Hymenæa courbaril, L.*, and it may be also obtained by tapping the tree. It is said to be the gum anime of commerce, and is sometimes used as a substitute for copal.]

103. Morrison & Knox, *Demerara.*—Collectors.
Isinglass, or fish-glue, the dried swim-bladder of *Silurus Parkerii, Traill*, a very abundant fish in the rivers and estuaries of the colony.

FRANCE.

104. Godin, sen., *Chatillon-sur-Seine, Cote d'Or.*—Producer.
Fleeces of rams raised in France.

105. Graux, J. L., *Commune de Juvincourt, Aisne.*—Producer.
Fleeces of great fineness, from a peculiar variety of the merino sheep.
[These specimens are of very great interest. They were produced from a new variety of the merino sheep—one of those very rare instances in which the origination of a distinct variety of a domesticated animal can be distinctly traced, and all the attending circumstances authenticated. In 1828, one of the merino ewes of M. Graux produced a ram, remarkable for the long, smooth, straight, and silky character of the fibre of the wool, and for the smoothness of its horns. In the next year, M. Graux employed this ram with a view to obtain others having wool of a similar kind. The produce of 1830 included one ram and ewe with fleece of the desired quality; in 1831 there were four such rams and one ewe; and in 1833 the rams were numerous enough to serve the whole flock. In each subsequent year the lambs have been of two sorts, one preserving the characters of the ancient race, the other resembling the new variety; and some combined the long silky wool with a better formed body than had belonged to the first of the new variety. By a system of cross-breeding, M. Graux succeeded in eliminating the malformations of the original variety, while he preserved the long silky fleece. The new breed (Mauchamp) is now numerous enough for exportation; and, by crossing with the ordinary merino, has also produced a valuable wool, known as "Mauchamp-merino." The wool of the pure Mauchamp is glossy and silky, similar to mohair; and, owing to its length and fineness, is an excellent combing-wool. It is highly esteemed by the manufacturers of Cashmere shawls, being second only to the true Cashmere fleece in the fine flexible delicacy of the fabric; and, combined with the wool of Cashmere, imparts qualities of strength and consistence in which that is deficient. The quantity of wool yielded by the Mauchamp breed is less than that of the merino, but this is more than compensated by its greater price.]

106. Butin, Lecat, *Commune de Taurcoing.*—Producer.
Samples of peeled flax.

107. Leroy-Dubois, *Dep. Ille-et-Vilaine.*—Producer.
Specimens of flax, raw and peeled.

108. Boulat, Jr., *Paris.*—Manufacturer.
Hare and cony fur, for manufacture of hats.

109. Nicod (widow) & Son, *Annonay, Ardèche.*—Producer.
Eggs and cocoons of the silk-worm.

110. De Tillancourt, E., *Champs Elysées, Paris.*—Producer.
Specimens of raw silk, white and yellow.

111. Affourtit, G. F., *Courbessar, Gard.*—Producer.
Cocoons and raw silk.

112. Nogarede, J. L., *St. Jean de Gard.*—Producer.
Raw silk in hanks.

113. Bonneton, J., *St. Vallier, Drome.*—Silk-throwster.
Cocoons, and specimens of raw and thrown silk.

114. Vincent, J., *Valleraugue, Gard.*—silk-spinner.
Samples of raw silk, white and yellow.

115. Ressegaire, J. B., *St. Ruf, near Avignon.*—Producer.
Samples of raw silk from cocoons from Liban.
[The silk-moth (*Bombyx mori*) is a native of China, and was introduced into Europe, in the reign of Justinian, by two Nestorian monks, who brought the eggs in a hollow cane. The rearing of silk-worms was confined to the Eastern Empire for six centuries; in the 12th century it was introduced into Sicily, and not long after into Italy; whence this industry has passed into Spain, France, England, and the New World.
Silk is secreted by a pair of glandular tubes, terminating in a spinnaret on the under lip of the larva. Before their termination the tubes receive the secretion of another gland, which glues together the filaments of the two *sericteria*, the apparently single thread being therefore double. The larva commences spinning, when fully grown, by attaching threads to convenient points, until its body is loosely inclosed by the threads. The thread is then fastened in a zig-zag manner in all directions, and the cocoon is usually completed in about 5 days. All this time the larva diminishes in size, and finally casts its skin and becomes a chrysalis.
The breeding of silk-worms has been for many years the object of systematic care and advancement in France, and in that country are produced cocoons of the largest size, composed of long, strong, even, fine, and lustrous thread. As in the case of domesticated animals of a higher class, the silk-worm has become the subject of several varieties. In France the varieties, *Sina, Syrie,* and *Novi* are esteemed and cultivated. The remarkable and successful experiments of Major Count de Bronno Bronski, of Chateau de St. Selves, near Bordeaux, can be only alluded to here. Major Bronski commenced his trials in 1836, and by repeated selections and cross-breeding of individuals of the three varieties just mentioned, conducted with the most exemplary patience and scientific skill, he has obtained a race of silk-worms not subject to disease, and which produce large and equal-sized cocoons. The silk is pure white, strong, and lustrous, equal throughout, and certified to have an average length of 1057 metres or 1154 English yards.]

106. Alleon-Canson, H., *Annonay, Ardèche.*—Manufacturer.
Albumen of eggs, dried and prepared to fix the ultramarine employed in calico-printing.

107. Jolly, F., *Mer, Loire et Cher.*—Manufacturer.
Purified oil for watches, fire-arms, and fine machinery.

108. Pommier, P., *Rue de Veuve Coyuenard, Paris.*—Manufacturer.
Varnish for carriages.

109. Le Fevre, B., *Rue Montmartre, Paris.*—Manufacturer.
Specimens of varnish of various kinds, for carriages, furniture, and the fine arts.

110. Soehne, Brothers, *Paris.*—Manufacturers.
Varnishes for leather, woods, metals, and for oil and water-color paintings.

111. Steinbach, James J., *Petit Quevilly, near Rouen.*—Manufacturer.
Specimens of starch, fecula, and gums employed in calico-printing.

112. Faure & Escoffier, *Avignon.*—Manufacturers.
Samples of madder, the root, and the powder prepared from it.

THE GERMAN STATES.

113. Roemer, Carl, *Brühl, Baden.*—Manufacturer.
Refined oil, obtained from bones, and other animal substances, capable of resisting intense degrees of cold.

114. Fabian, C. G., *Breslau.*—Manufacturer.
Samples of Pine Oil (*Pinus sylvestris*).

115. Schramm, P. J., *Neuss-on-Rhine.*—Manufacturer.
Samples of wheat starch, used to dress fine linen and cotton goods.

116. Schramm, L. F., *Dessau, Baden.*—Manufacturer.
Specimens of fine vegetable oil for watches, &c.

117. Fleitman & Weddigen, *New York.*—Importers.
Samples of Saxony wool.

118. Schutza, Henay, *Schwartza, Saxony.*—Producer.
Samples of Saxony wool.

119. Siegle, Heinrich, *Stuttgart.*—Manufacturer.
Specimens of carmine, carmine lac, prepared for coloring paper and paper staining.

120. Knosp, Robert, *Stuttgart.*—Manufacturer.
Samples of indigo and carmine.

121. Elsner, J. G., *Breslau.*—Producer.
Samples of merino fleeces.

AUSTRIAN EMPIRE.

122. Radulowitz, Brothers, *Weisskirchen, Hungary.*—Producers.
Samples of raw silk.

123. Raffelsperger, F. G., *Vienna.*—Producer.
Specimens of bristles.

124. Matiuzzi, G. B., *Friuli.*—Producer.
Specimens of various raw silks.

125. Sozzi, P., *Bergamo, Lombardy.*—Producer.
Samples of raw silks.

126. Petz, W., *Pesth, Hungary.*—Manufacturer.
Two varieties of carmine.

127. Scheiffle, G. S., ———.—Collector.
Various samples of wool, selected by permission from fleeces shown at the London Exhibition of 1851.

128. Bacirich, Johann, *Vienna.*—Manufacturer.
Specimens of prepared and unprepared agaric for German tinder, medicated agaric for rheumatism, and for linings of clothing, &c.

THE ITALIAN STATES.

130. Montu, G. & Co., *Turin, Sardinia.*—Manufacturers.
Specimens of the tribolo, or Piedmontese heath sprigs, for the manufacture of brushes. Brushes of the same.

131. Lanza, Brothers & Co., *Turin.*—Manufacturers.
Stearine, and stearine candles.

132. Gerardi, Martini, *Turin.*—Manufacturer.
Variety of oil-seeds.
Specimens of colza, nut, linseed, and castor oils.

133. Ridolfi, Michele, *Lucca, Tuscany.*
Colors employed in encaustic painting, and specimen of painting executed with them.

134. Tranquilli, Giovanni, *Ascoli, Papal States.*—Producer.
Specimens of raw silk.

SWITZERLAND.

135. Fogliardi, J. B., *Mélaut, Canton Ticino.*—Producer.
Specimens of raw silk.

BELGIUM.

136. Van Geetarungen, Casimir, *Hamme, East Flanders.*—Manufacturer.
Specimens of Indian wheat starch.

137. Claude, Louis, *Brussels.*—Manufacturer.
Oil of colza, purified for the use of Carcel, Moderator, and similar lamps.
[This is one of the valuable vegetable oils but little known in America, though manufactured to a large extent in Europe. It is expressed from the unctuous seeds of a species of wild cabbage (*Brassica napus sativa*). It has been found better, in its pure state, than any other oil for lubricating machinery. It is also much used for burning in lamps, and in the French lighthouses it is preferred to any other oil in use on account of its "greater brilliancy and steadier flame, with less charring of the wick, as well as for its greater cheapness."]

THE NETHERLANDS.

138. Oomen, Antonius, *Maria, Ginneken, near Buda.*—Manufacturer.
Collection of oil-seed cakes, for feeding cattle, and for manure.
Collection of vegetable oils, rape, colza, linseed, hempseed, and from *Camelina Sativa.*
Glue for manufacturing uses.
Samples of gelatine.

139. Van Berkhout, Teding, *Heuman.*—Producer.
Samples of dogs' wool.

140. Noortveen, J. H., & Co., *Leyden.*—Manufacturers.
Varnishes of various kinds.

141. Catz, P. S., & Co., *Amsterdam.*—Manufacturers.
Specimens of horse-hair, of extra and ordinary length, for weaving cloth, sieve-cloth, and for brushes.
Curled hair for stuffing chairs and mattresses.
[In manufactures two kinds of horse hair are employed—the straight and the curled. The long straight hair is woven into cloth for sieves, and also for ornamental purposes, as the damask hair cloth for furniture. For this purpose it is first steeped in some alkaline solution, and then dyed of any required color. The lustre of the cloth is imparted by hot calendering. Hair not long enough for weaving is made into ropes. These being boiled, to give the fibres a permanent twist and springiness, are converted into the *curly* hair.]

142. Poel-weyers, J., *Zaandam.*—Manufacturer.
Specimens of linseed oil and oil-cakes.

143. Poel, J. W., *Zaandam.*—Manufacturer.
Samples of gelatine and glue.

144. Van Vollenhoven & Co., *Rotterdam.*—Manufacturers.
East Indian rattans.

145. Verhagen, O., *Goes.*—Manufacturer.
Specimens of salt.

146. Prins, C. C., & Co., *Wormerveer.*—Manufacturers.
Specimens of Urling's patent starch.

147. De Jager, Evert, *Zandyk.*—Manufacturer.
Samples of starch.

148. Stuurman, J., *Zandyk.*—Manufacturer.
Samples of starch.

149. Vandenbergh & Co., *Zutphen.*—Manufacturers.
Samples of glue.

150. Vandenbosch, J. J., *Wilhelminadorf, near Goes.*—Manufacturer.
Specimens of madder, manufactured by steam.

152. Voute, W. & C., *Amsterdam.*—Manufacturers.
Collection of madder, garancine, and indigo.

[Garancine is a chocolate-colored powder, without taste or smell, and of variable quality, prepared from madder. The substance and mode of preparing it from fresh madder were described by MM. Robiquet and Colin in 1828. In 1843 a patent was taken out for a mode of preparing garancine from refuse madder, which, having been once used in dyeing, had before been thrown away as spent and valueless. The process, too long to be described here, is chiefly conducted through the agency of sulphuric acid and steam, and has been productive of great saving and advantage.]

153. Ellerman, A., *Rotterdam.*—Producer.
Specimens of Holland flax.

154. Van Catz, J. P., *Gouda.*—Producer.
Samples of Holland and Friesland flax.
Samples of horse-hair.

SWEDEN AND NORWAY.

155. Thesen, J. P., *Christiana.*—Collector.
Specimens of various Norwegian woods.

SPAIN AND CUBA.

156. Martinez, A. Rey & Co., *Cadiz.*—(Aguine & Galway, *New York*, Agents.)—Manufacturers.
Five hanks of raw silk from the manufactory, Talabera de la Reyna.

HAYTI.

157. Faustin I., Emperor of Hayti.
Bark of the silkwood, pepperwood, and rosewood trees.
Samples of hemp.
Samples of white and yellow wax.
Block of mahogany (acajon á fleur) remarkable for its size.

General Note on the Structure of Woods, &c.

The numerous specimens of woods exhibited from the United States and British Guiana invite a more extended note upon the structure of woods, their peculiar properties, the mode of preserving them, &c.

The trunk and branches of a tree serve as the support of the organs of digestion and respiration, the leaves; and they also contain the apparatus for the circulation of the nutritive fluids of the tree, and receive the secretions deposited from them. The apparently homogeneous tissue of wood is seen under the microscope to be made up of minute longitudinal tubes, which vary in diameter from one 200th to one 2,000th of an inch, and are arranged in concentric rings around a central pith. These tubes are the circulatory apparatus. There is, besides, a cellular tissue; so called because it is made up of numerous little shut cells, formed of a delicate and transparent membrane. Cellular tissue is most abundant in herbaceous plants; in trees and woody plants it forms the pith, and the so-called medullary rays which radiate from the pith to the bark.

Trees are divided into two great classes, *exogens* and *endogens*, according to the manner of their growth. In exogens (outside growers) the annual growth consists of an addition to the external ring of wood and to the internal ring of bark; these annual rings are distinctly marked, and indicate the age of the tree. They comprise the trees of temperate climates; in fact, nearly all the woods which are used in the arts. Endogenous trees, as palms, bamboos, &c., have only one set of fibers, the longitudinal; their structure may be seen by cutting across a rattan or cornstalk. The fibers appear as irregular dots, which are oldest and most compact near the circumference, while the newest fibers are nearer the center, loosely scattered in the pith, or leaving the center of the stem hollow. Only a small part (the lower) of the stems of such trees is available as wood.

To return to exogenous trees: a section of the stem will show, first, a center or pith, composed of cellular tissue; second, the annual rings of woody tissue, arranged concentrically around the pith; third, an exterior covering, the bark, consisting of several layers; fourth, lines of cellular tissue, radiating from the pith to the bark, called medullary rays or plates.

Vessels running among the fibers convey the crude sap from the roots to the leaves, in which it is elaborated; it then returns through the bark, combining with that in the external layers of the wood, forming a viscid gelatinous liquid, known as the *cambruin;* this eventually becomes consolidated into the new annual ring, forming a part of the substance of the tree. The innermost layer of the bark is called the *liber.*

The medullary rays, though often imperceptible to the naked eye, are always present in exogenous trees. They vary in length from a quarter of an inch or less, as in the maple, to several inches, as in the oak; they seem to constitute the principal source of strength in the woods, from their combining and holding together continuous parts. The plates have often an expanded, flattened character, which gives to polished vertical sections of many woods the glossy appearance known among carpenters as the *silver-grain,* so beautiful in cabinet work.

That portion of the annual ring which grows towards the close of the season is the densest, which causes the rings to be usually well defined; if, from mild weather or a tropical climate, the growth should be of nearly the same density, the annual circles will be indistinct—this fact has frequently been noticed. A favorable exposure to sun and air will develop one side of a tree more than another; and one annual ring will be thicker than another, according to the difference of seasons. The interior hardened layers are known as the duramen, or heart-wood, the exterior softer ones as alburnum, or sap-wood; the latter is lighter colored, softer, and more liable to decomposition than the former, and is separated from it in the working up of timber. The quantity of sap-wood is generally about the same in thickness in the same kind of wood, but it is very different in different woods.

In the oak and teak, sap-wood is rapidly converted into heart-wood; in our locust tree (*Robinia*) this conversion takes place in three years, being one of the greatest advantages of this valuable wood; while in the poplar and willow it is so slow that the white soft wood is only fit for temporary uses.

The circulation of the sap is considered to be limited to the alburnum; the dense heart-wood would seem to have no connection with the bark and alburnum, from the fact that trees of vigorous growth externally are decayed at the heart; and many of the hard foreign woods are rarely sound in the center, showing that their internal decay must have commenced while they were standing in their native forests.

The tubes of woody tissue contain the substance called vegetable albumen, the principal constituent of the sap, closely resembling animal albumen (or white of egg) in composition and properties. This albumen contains nitrogen, and is therefore exceedingly liable to decomposition; the dry-rot in timber is caused by contact with albumen in a state of decomposition. Different woods vary in the amount of albumen they contain; in the soft woods it averages from one to two per cent.

Starch is also deposited in the vessels of wood, especially in the winter season, and may be extracted by mechanical processes.

The basis of wood, constituting 95 or 97 per cent. of its dried material, is lignin, a white, spongy, powdery cellular substance, obtained by digesting wood in ether, alcohol, water, a diluted acid, and alkali. It possesses properties which readily distinguish it from all other vegetable principles; to enumerate these would lead us too far into the domain of chemistry. It is the same in all kinds of trees. M. Payen considers lignin as made up of the primitive woody tissue, which he calls cellulose, and the true ligneous matter which gives hardness to the heart-wood—these he has separated from each other. Its constituents are carbon, hydrogen, and oxygen.

When subjected to destructive distillation in close vessels, wood gives off many volatile products, as acetic acid, wood-tar, many oily and spirituous substances, carbonic oxyd, water, and compounds of carbon and hydrogen. The flame of burning wood arises from the combustion of these gaseous matters; and is the greatest in dry wood, where no heat is lost by the evaporation of contained water; the carbon becoming carbonic acid, the hydrogen becoming water by uniting with the oxygen of the air and of the wood; only a small quantity of white ash, derived from the earthy and saline matters of the sap, remains behind. According to MM. Peterson and Sebödler, the amount of heat given out by the dry woods is as follows, the first named giving the greatest, and the last named the least: European lime, elm, fir and larch, maple and pitch-pine, walnut, oak, ash and birch, and beech. As it is not always easy to secure the conditions necessary for perfect combustion, viz., high temperature and sufficient air, the volatile products are incompletely consumed, and smoke (consisting principally of solid carbonaceous particles) is produced; by consuming smoke, therefore, which is practicable in large manufacturing establishments, a great saving of heat would be effected; the enforcement of a law to that effect, as recently attempted in England, would rid large manufacturing cities of a great nuisance, as well as add materially to the economy of manufactures.

Timber is generally felled during the cold months, when vegetation is dormant and the amount of sap the least; but many foresters in this country are of opinion that September is the best month to fell. The growth of the year is then completed, and the leaves have not yet fallen; there is considerable advantage in being able to avail ourselves of the great evaporation which takes place from the surface of the living leaves after the tree is felled; by this natural means most of the moisture remaining in the wood is soon removed, and the remainder is gradually taken up as after the usual time of felling.

In the state in which it is felled, wood is unfit for use in the arts; besides the contraction which the tissues undergo as the sap evaporates, the albumen is very liable to become decomposed, and cause the decay of the wood. Accordingly, the wood must be dried or seasoned, either by exposure to a free current of air, or by drying it in ovens, in a vacuum, in a highly rarefied atmosphere, or by exposing it to the action of steam. Sometimes wood is immersed in running water for several weeks,

in order to dilute and wash out the sap, after which the seasoning is supposed to be more complete and speedy: division into logs and planks very much hastens the process. The closer the grain, the longer is the time required for seasoning; several years are required for a large piece of oak timber to become properly seasoned.

Not only decay, but irregular contraction and splitting occur in unseasoned woods, especially in the direction of the medullary rays; there is rarely any material alternation in the length of timber. This shrinking, warping, and twisting, is a source of great trouble to the carpenter and cabinet-maker. Warping and winding arise from the curved direction of the fibers, and from their spiral arrangement in many trees: box-wood is often much twisted in this manner. In straight-grained woods, as deal and mahogany, there is generally very little contraction; but in some of the ornamental woods, having great confusion of fibers, the shrinking is so extremely irregular that much distortion, and even cracking, is the result. In the more valuable woods, the thinness of the veneers into which they are cut remedies this evil, as permanence of form may be cheaply secured by glueing them upon some firm straight-grained wood. In teak-wood, such contraction is hardly perceptible; while in the soft woods, and even in the rock-elm (according to some), the contraction is half an inch in a foot. The foreign woods of hot climates are very apt to be defective from shrinking and cracking, on account of a seasoning improperly conducted in a hot sun or wind. Woods contain, in the green state, from 38 to 45 per cent. of water, all of which can never be removed by drying in air of the ordinary temperatures; when thoroughly dried, wood will reäbsorb water from a moist air, usually to the amount of 10 per cent. Furniture, made of wood thoroughly seasoned in Europe, when brought to this country, and particularly to New England, is very apt to shrink and crack; this is now known to depend on the exceeding dryness of our atmosphere, compared to that even of continental Europe.

Woody fiber has a considerably greater density than water; and the fact that most woods float is owing to the presence of a large quantity of air in the pores of the wood, which is not ordinarily displaced by water unless by very long digestion; but under strong pressure, or under an air-pump, water readily enters the pores and the wood sinks. A fact mentioned by Mr. Scoresby also shows this: A boat had been dragged down by a wounded whale; on coming to the surface the animal was killed, but the boat, instead of rising, was found suspended by the harpoon beneath the whale; every part of the wood was so completely saturated with water, under the strong pressure of the depths of the ocean, that the boat sunk immediately to the bottom.

The specific gravity of the woods, therefore, indicates their porosity, and not the weight of the true woody fiber, which is nearly the same for all kinds of wood. In general, the weight of a wood is a good criterion of its hardness; for instance, lignum-vitæ, box-wood, iron-wood, sink in water, while the soft poplar and willow are only half as heavy as water. The densest known wood, the iron-bark wood, from New South Wales, has a specific gravity of 1·426; and its strength is 1·5, that of oak being 1. The lightest of the true woods is the Cortica, or Anona palustris, from Brazil, whose specific gravity is only 0·206, which is lighter than cork; it resembles ash, but is paler, finer, and softer. The same kind of wood varies in density, according to soil, climate, age, and other circumstances. Many woods owe their density to resin or gum, which fills the spaces, which would otherwise be empty: the gum seems to act as a cement, and to unite the fibers more firmly together; such woods are also more durable, as they are better defended against moisture and insects.

The elasticity of wood depends on the straightness of the longitudinal fibers, the freedom from knots, and the simple character of the medullary rays: the most elastic woods, as lance-wood, hickory, ash, are the easiest to split; while those in which the fibers are much interlaced, as the lignum-vitæ and gnarled oak, are split with the greatest difficulty—the interlacement of the fibers, while it deprives wood of elasticity, makes it exceedingly tough, and at the same time gives to many specimens, when polished, a very beautiful appearance. The elasticity of woods is much increased for the time by steaming, which is the method employed for bending them for ship-timbers, shafts, staves, &c.; the curve being parallel to the grain, greater strength, as well as economy of material, is the result. Timber steamed at 482° F. has its fibers drawn closer together; maple and pine thus treated are rendered more valuable for musical instruments, as sound-boards, &c.; walnut becomes darker colored from the formation of a kind of tar, which tends to preserve it; the loss of weight is from one-third to one-half. Mechanical compression greatly increases the density of wood; this is practiced in making the tree-nails for ships, by driving them through metallic rings smaller than themselves into the ship's side (after Mr. Annersley's patent, 1821); the fibrous structure is not lacerated, and the wood becomes so hard as to ring when struck; fir may thus be rendered as compact as pitch-pine.

Professor W. R. Johnson has given a very interesting series of experiments on the retaining power of different species of timber on iron, in Silliman's Journal, Vol. 32. The retentive power on iron spikes holding iron rails was as follows: Locust had the greatest, then white oak, unseasoned chestnut, yellow pine, and hemlock, in the order of enumeration. As the total retentiveness of the wood must depend on the number of fibers longitudinally compressed by the spike, and as these fibers should press as nearly as possible in their longitudinal direction, and with equal intensity throughout the whole length of the iron, a broad flat spike is the best. An obtusely-pointed spike, in soft and spongy wood, drives the masses of fibers downwards and backwards so as to place the faces of the grain of the timber in contact with the surface of the metal, greatly impairing its retaining power.

Luster, figure, and color, are the elements of beauty in the woods. The direction and interlacing of the fibers has been alluded to as one source of beauty; a horizontal section of a tree shows only the annual rings and a few medullary rays, and is generally the least beautiful, unless there is variety of color to aid the appearance of the fibers; oblique sections, though less strong, are more beautiful, but on account of the waste of the wood are only employed for veneers requiring a particular figure; the vertical section, through the heart of the tree, gives the strongest, as well as the most beautiful arrangement of the longitudinal fibers, and the best view of the medullary plates, with the origin of the principal branches. The confused arrangement of the fibres in the fork of the branches causes the "curls" so desirable as ornaments, and which are common in mahogany; internal knots, by disturbing the fibers, are quite ornamental in many woods, and very desirable for turning operations.

The roots of trees, as of the yew, the oak, and the walnut, from their gnarled character, may often be cut into beautiful veneers; the excrescences on the elm, the yew, and Amboyna wood, are highly prized for cabinet work.

The eyes and spots of bird's-eye maple are well known sources of ornament; according to Mr. Holtzapffel, the bark of the maple has projecting internally spines or points, upon which the layers of the wood are moulded, each of the fibers being at these points abruptly curved; when cut by the plane obliquely, they give the appearance of projections or eyes; the lines between the dots are the edges of the medullary rays—this effect of the spines on the wood, he believes, exists only in the bird's-eye maple.

The medullary rays are another source of ornament; as they are generally darker colored than the fibers, in different lights they present a peculiar effect, like that of a shot-silk or damask; considerable skill is required to cut the different woods in the manner best suited to display the silver grain, so that as many as possible of the medullary rays may "crop out" on the surface of the work. In the plane-tree, the rays are of a rich chestnut-brown, and the fibers almost white; also in some specimens of elm, satin-wood, and mahogany, there is a similar contrast of colors. In the laburnum, according to Mr. Aikin, there is a peculiarity not noticed in any other wood, namely, the medullary plates are large, distinct, and of a white color, while the fibers are dark brown, which gives it a most extraordinary appearance.

Different colors in the annual rings often produce beautiful appearances, when the colors are bright and well defined; this may be seen in the yew, walnut, rose-wood, mahogany, king-wood, tulip-wood, and lignum-vitæ; in the plank section, such woods become veined, striped, and mottled in the most singular and beautiful figures, as may be seen in any piece of rich furniture. Most elegant pictures in Mosaic work may thus be made of pieces of naturally colored woods, applied to smooth surfaces; many floors, made two centuries ago, now exhibit the most exquisite contrast of colors and beauty of design.

The brown or dark woods most used in this country for ornamental purposes are mahogany, rose-wood, walnut, oak, king, and zebra-wood, lignum-vitæ, and sometimes sandal-wood. The only perfectly black wood is ebony; the bog-oak (so-called), sometimes quite black, owes its color to a small portion of iron, contained in the bog, having united with the gallic acid of the wood, forming a chemical stain, analogous to ink. The principal light woods are satin-wood, box-wood, bird's-eye maple, ash, and fustic. The red woods, cane-wood, red saunders, are used principally for inlaid work. Cedar, juniper, the linden, the sycamore, and the yew, are also considerably used.

The properties of the principal American woods which make them valuable in the arts are as follows:—

Oak.—The oaks are generally very strong, but cross-grained, and liable to warp and crack under changes from moisture to dryness. The live oak (*Quercus virens*) is the hardest and densest of the genus. It grows in the Southern States, near the sea; the sea air seems necessary to its existence, as it is rarely found more than 15 or 20 miles in the interior. The rings of annual growth are very faint, adding to the density of the fibers; the medullary rays are very distinct, traversing in strong pale lines the faint waves of annual growth. The chief use made of it is in ship-building; in the United States Navy, all the frames and principal pieces are made of it; vessels made from oak, cut on the coast of Georgia 30 years ago, are now in excellent condition.

The white oak (*Quercus alba*) is used for keels, side-timbers, and planks of vessels; for frames of houses, spokes, agricultural implements, staves and casks, pumps, &c., and other uses requiring great strength; the roots often will make most beautiful furniture, and from a single tree will sometimes bring thirty dollars. American white oak has not a very good reputation in England, for the reason that the wood generally introduced there is from Canada, which is never used here except for inferior purposes; the oak from the seaboard of the Middle and Southern States is equal to the best foreign timber.

The red oak (*Quercus rubra*) is only used for ornamental purposes, and should be cut obliquely to show the reddish silver-grain. From the bark of the black oak (*Quercus tinctoria*) is obtained the *quercitron* used by dyers. The bark of most of the species is used in tanning, and they all furnish valuable fuel and charcoal.

Pines and Firs.—This class of trees exceeds all others for the variety of valuable uses to which they may be put. They thrive best in cold climates; they differ somewhat in color, according to the amount of resinous matter they may contain, whence has arisen most of their popular names. The general characters of the wood, and its innumerable uses in ship-building, house-carpentry, and the commonest articles of life, are too well known to require any detail; it makes the best masts of vessels; it is invaluable for the production of pitch, tar, and turpentine, and for piles and foundations in wet places; Amsterdam and Venice are built upon piles; it is commonly said that what their houses are built upon costs more than what is built upon it; under the Stadt-House of Amsterdam were driven nearly 14,000 pine piles.

The pitch-pine (*Pinus rigida*) is the best for decks, floors, mill-wheels, sleepers, aqueduct-logs, and for the fuel of steam-engines. Its great defect in ship-building is the comparatively insecure hold it gives to spikes; it is very durable when exposed to alternate wet and dry.

The white pine (*Pinus strobus*) has a wood remarkably light, soft, homogeneous, and easy to work; it does not decay in the open air, and does not change its dimensions on exposure to the weather. It is the wood of the joiner and the ornamental carver; it receives paint better than any other wood. The roots are almost indestructible, and make excellent ragged fences.

In Europe, the wood of the *P. abies* is used for the manufacture of paper. It is reduced to a pulp, and a small quantity of linen added, which makes a fine paper not requiring sizing; it is not so white as that made from rags, but it is excellent for printing, especially in colors, and for pasteboard. The Germans also manufacture what they call "Pine-needle wool," by the chemical decomposition of the leaves of *P. sylvestris;* it is used for purposes of upholstery instead of hair, over which it has the advantages of being more durable, elastic, and free from insects and mould. Both of these are German inventions.

The black and white spruce (*Abies nigra* and *alba*) are light, durable, and strong, and are much used for spars, ladders, and building materials. Hemlock (*A. canadensis*) is coarse-grained and "shaky," though firm and durable when not exposed to the air; hence it is much used in parts of houses which are to be covered, and, for its hardness, for threshing-floors. It was formerly much used for wooden pavements, sawn into hexagonal blocks; from their slipperiness, they are now generally discarded. Its bark is valuable in tanning.

The Southern pine (*P. palustris*) is appropriated to the same uses as the white pine in the North, but it is harder and stronger, and preferred for many parts of ships.

The American Larch, called Hackmatack and Tamarack (*Larix Americana*), has a very heavy, compact, strong, and durable wood, surpassed only by the oak; it is much used in ship-building, especially for knees and beams, and will outlast even oak itself. It is so compact as to be nearly incombustible, unless splintered.

The cypress family, including the arbor-vitæ (*Thuya occidentalis*), the white cedar (*Cupressus thyoides*), and the red cedar (*Juniperus virginiana*), are remarkable for the durability of their wood and agreeable aromatic odor, preventing the attacks of insects. The white cedar is much used for posts, shingles, and wooden ware; it grows in swampy ground. The red cedar grows in dry barren soils; the heart-wood is of a bright red color, and is very durable; it is used for making pencils, for drawers, posts, and is highly esteemed by ship and boat builders. The Southern Cypress (*Taxodium distichum*) is a soft, fine-grained wood, yet strong, and sustaining heat and moisture for a long time without injury.

Walnut.—The black walnut (*Juglans nigra*) is a wood of great tenacity, hardness, strength, and durability; it is of a fine grain and dark color, becoming almost black with age. Its toughness makes it very valuable for gun-stocks. The beautiful shades of the wood, and the fine polish of which it is susceptible, make it very much sought after for articles of furniture and costly cabinet-work, which will compare favorably with mahogany for beauty. The two polished slabs in the Canadian Department show admirably the peculiar features of this wood. The Butternut (*Juglans cinerea*) is lighter-colored, tough, and not liable to the attack of worms; it makes excellent gun-stocks, drawer-fronts, posts, rails, and panels of carriages; it receives nails and paint extremely well.

Hickory.—This genus is peculiar to America. The Shell-bark, Mockernut, and Pignut Hickory, respectively (*Carya alba, C. tomentosa,* and *C. porcina*), have a smooth, close-grained, and hard tough wood, which makes them very valuable in the arts; the wood is, however, liable to warp and shrink, and to be attacked by worms, unless in salt water, where it is very durable. As fuel, it is the best wood. From it are made canes, hoops, screws, tool-handles, and handspikes—when seasoned it is as durable as lignum-vitæ, and is then used for mallets and beetles, being tougher than oak. As a material for carriages it is invaluable, for its strength and lightness; witness the "Gazelle Wagon" in the Exhibition, most of which, and especially the running-gear, is made of hickory; there is no European wood from which a carriage equally light and strong could be made. The superiority of our materials is the chief reason of the excellence of our vehicles, contrasting remarkably with the heavy and clumsy carriages of Europe. It is used for rake-teeth, bows of yokes, axe-handles, axletrees, tide-mills, &c. The amount of alkali in its ashes make it valuable in soap-making; charcoal made from this wood is among the best.

Maple.—The red maple (*Acer rubrum*) has a fine-grained, rose-colored wood, compact and smooth, the silver-grain being in very narrow and close layers. It takes a fine polish, and is much used for common furniture, as it turns easily. It is not strong, and decays quickly when exposed to alternations of moisture and dryness. The curled variety is characterized by fibers running in a serpentine direction, having the luster of changeable silk, which has a fine effect in cabinet-work; it is much used for panels and footboards.

The rock maple (*A. saccharinum*), besides the valuable properties of its sap, is one of the most beautiful of our native woods; it is hard and close-grained, and takes a fine polish. The straight-grained varieties resemble satin-wood in their luster. The most beautiful and well known variety is the Bird's-eye Maple, the cause of whose appearance has been given above; according to the section the wood becomes "eyed" or mottled, displaying the beautiful, but irregular contortions of the fibers, in a manner sufficiently familiar in cabinet-work. The straight-grained variety is much used for tubs and buckets, and is preferred to all other woods for the making of lasts; of this material 25,000 a year are made in one shop in Lynn, Massachusetts. It is next to white oak for keels. The grain may be rendered more distinct, by rubbing with dilute sulphuric acid.

The *A. macrophyllum*, indigenous to Oregon and the North-West Coast, is a fine and large tree; it has the bird's-eye and curled structure in almost every tree; it is scarcely inferior to the finest satin-wood.

Ash.—The white ash (*Fraxinus acuminata*) is the most elastic and tough of our native woods; it is light, strong, durable, easily split, and permanent in its dimensions. It is excellent for works exposed to sudden strains, as the frames of machines, shafts and springs of carriages, oars, felloes of wheels, blocks and cleats, and other nautical implements, agricultural tools, handspikes, spears, bows, billiard-cues, pump-boxes, chair-frames, carriage-bodies, &c. The wood of the black ash (*F. sambucifolia*), beaten and separated into their uniform ribbons, is much employed in the manufacture of baskets, and for the bottoms of chairs.

Chestnut.—The wood of the American chestnut (*Castanea vesca*) is coarse and porous, but strong, elastic, and durable in unfavorable circumstances. It is much used for posts, beams, joists, being almost imperishable; it is extensively used for sleepers on railroads; in furniture it makes the best frames, as it receives veneers better than any native wood. As a fuel, it is dangerous from its tendency to snap.

The Chinquepin (*C. pumila*) is more durable for posts than any other timber except red cedar (*C. Americana*); will take a fine polish, with beautiful waves and feathered figures, distinctly seen through a pale light ground.

Beech.—The wood of the American beech (*Fagus Americana*) is hard, fine, close-grained, and smooth; it is not liable to warp. It is excellent for the turner's use, for wooden-ware, plane-stocks, chair-posts, cart-bodies, lasts, saw and tool-handles, common bedsteads and furniture. It lasts well under water, but not in buildings. Large wooden printing-types are usually made of it. It is a good fuel. It is readily stained to imitate rosewood and ebony. In England, glassblowers use beech-wood almost exclusively in welding or fusing on the handles of glass jugs, which process fails when the smallest portion of sulphur, &c., is present; whence it may be concluded that this wood is almost chemically free from foreign matters; oak is next in estimation for this purpose.

Elm.—The American elm (*Ulmus Americana*) is highly esteemed for the toughness of its wood, which does not readily split; it bears the driving of nails and bolts better than any other wood, and is exceedingly durable when constantly wet; it is therefore much used for keels, pumps, wet foundations, water-works, coffin-boards, &c. From its toughness it is almost always used for the hubs of wheels, blocks, and yokes. It is liable to warp, and to the attack of insects. Michaux considers the wood of the slippery elm (*U. fulva*) as superior to the common elm for the above purposes, which is probably true; indeed, it is much employed in the Western States in the construction of houses and vessels; its rarity on the Atlantic coast is the cause of its limited consumption here. The English elm (*U. campestris*) has been extensively introduced in Massachusetts, but it is too valuable for ornament to be used in the arts.

Birch.—The great defect of birch timber is its liability to decay. The black birch (*Betula lenta*) has a wood which is easily worked, but firm, strong, and durable; the difference between the annual rings gives a clouded-landscape appearance, which makes it in some request for panels and cabinet-work. It is easily bent, and it is used for yokes and chair-frames. Some specimens are as handsomely figured as mahogany, and when colored and varnished can hardly be distinguished from it; it is sometimes called mahogany-birch. It makes an excellent fuel. The yellow birch (*B. excelsa*) is more easily bent than the former, and is much used in chair-making. The red birch (*B. nigra*) has a nearly white wood, longitudinally marked with red vessels; the twigs are used in Philadelphia for brooms for streets; the same use is made of the gray birch in New England. The canoe-birch (*B. papyracea*) is remarkable chiefly from the use made of its tough incorruptible bark in making canoes; one of these canoes is exhibited in the Canadian Department: the wood is soft and perishable, though it is sometimes used in chair-making, cabinet-work, for making hat-blocks, and the uses of the turner.

Locust-tree (*Robinia pseudacacia*).—This is one of the hardest, strongest, and most valuable of our native trees. The wood is remarkably compact, fine-grained, with the medullary rays more numerous and closer than in almost any other tree; for strength, durability, hardness, elasticity, and weight, it is superior to any northern oak, American or European. The largest pieces are used in ship-building, the smaller being used as tree-nails to confine the planks to the timbers. Where resistance to a strain is required there is no wood equal to it; the durability of the heart-wood, often used for posts and in situations exposed to the weather, is extraordinary. In the Northern States it is apt to be perforated by insects; in the Middle States, it is valued for all purposes where strength and durability are required; for floors and floor-timber of ships it is unrivalled. It is much used in the South for sleepers, mill-cogs, and articles exposed to constant wear. One of its most valuable properties is its very rapid growth; it converts sap-wood into heart-wood in three years.

Willow (*Salix*).—The wood of the willow is soft, light, elastic, tough, and pliant. The Osier (*S. viminalis*) is cultivated for its long slender shoots, for the different kinds of wicker-work. It is good for turning, for toys, ladders, druggists' boxes; when dried, it is used as a substitute for ebony; it is much used in works constantly exposed to water; its charcoal is very good for the manufacture of gunpowder.

Wild Cherry (*Cerasus serotina*).—The wood of this tree is a fresh mahogany color, growing darker with age; the medullary rays are very numerous and closely arranged; it is close-grained and compact, and susceptible of a high polish, and permanent in its dimensions when thoroughly seasoned. In cabinet-work, it is used as a cheap substitute for mahogany, from the beautiful appearance presented on an oblique section of the medullary rays. It is valuable for window-sashes, stair-rails, doors, gunstocks, &c.

Bass-wood (*Tilia Americana*).—This tree, also called American Lime, or Linden, has a white, soft, fine-grained wood; from its toughness and pliability, it is extensively used for the panels of carriages, and for the bottom and sides of drawers. It is well adapted for carving and turning; the famous carvings of Gibbons, at Windsor Castle, and St. Paul's, London, are in the European lime, which has become naturalized in this country; this wood is eulogized by Virgil, in his Georgics. It forms an excellent charcoal for making gunpowder. From the bark, separated by maceration into fibers, a coarse cordage is made; the Russia mats are made from the inner bark of the European tree.

Tulip-tree, or White-wood (*Liriodendron tulipifera*).—It has a remarkably white, soft, fine-grained wood; in the West it is used as a substitute for pine; from its flexibility, it is an excellent wood for coach-panels, circular mock-boards, and stair ends.

Button-wood, or Plane (*Platanus occidentalis*).—Notwithstanding the rapidity of its growth, its immense size, and ornamental appearance, the wood is of very little value, from its liability to warp and decay. According to Michaux, the roots have a fine red color when taken from the earth; if this color could be rendered permanent, the wood would be valuable for ornament.

Hornbeam (*Carpinus americana*).—The wood is white, close-grained, and compact, and exceedingly strong; it is used for beetles, levers, and other articles requiring great strength and solidity.

Iron-wood, or Hop-Hornbeam (*Ostrya virginica*).—This wood is remarkably compact, tough, and stiff; it is sometimes called *lever-wood*. From its extreme hardness, it is well adapted for cogs in mill-wheels, and levers; it is almost impossible to split it.

Ailanthus (*Ailanthus glandulosa*).—This much abused, but ornamental tree, is of very rapid growth; its wood is close-grained, and admits of a fine polish: it resembles satin-wood.

Alder (*Alnus serrulata*).—Though a tree of small size, the wood is valuable, not only as fuel, and for charcoal in the manufacture of gunpowder, but for hoops, pipes, pumps, and other objects continually under water. It is readily stained to imitate ebony, and acquires a high polish; the roots and knots of the larger trees are sometimes beautifully veined, acquiring, when made into cabinet-work, the color of mahogany. In Europe, it is extensively used for the soles of clogs and for sabots, being very light and durable.

Mulberry (*Morus rubra*).—According to Michaux, its wood is exceedingly hard and strong, and almost as durable as the locust. At the South, all that can be obtained is used in ship-building, especially for tree-nails; it is valuable for posts, and in boat-building and the light timber of vessels, it is preferred in Carolina to any wood except the red cedar.

Dogwood (*Cornus florida*).—The wood is of slow growth, hard, heavy, and solid, fine-grained, and susceptible of a high polish. It is sometimes called American *box-wood*, and is used as a substitute for this, and for the handles of tools.

Pear-tree (*Pyrus communis*).—The wood is heavy, firm, reddish-white, fine-grained, and next to box-wood for the purpose of wood-engraving. It takes a fine and permanent black stain, and can with difficulty be distinguished from ebony. From its toughness and little liability to warp, it answers well for turning, and the handles of tools; as a fuel, it gives out a great heat.

Apple-tree (*Pyrus malus*).—The wood is of a reddish color, fine-grained, hard, but light. It is much used by the turner, and is frequently made into walking-sticks; it is durable when used for cog-wheels: from its smoothness and hardness, it is used to make shuttles and reeds for weaving.

Tupels, or Pepperidge (*Nyssa multiflora*).—The wood is exceedingly tough; it is remarkable for the decussation and interweaving of its fibers, rendering it almost impossible to split it. In the Middle States, it is sometimes used for the naves or hubs of wheels, though it is inferior to the elm from its greater liability to decay on exposure to the weather. It is excellent for aqueduct-pipes, as it requires no hoops, and for hatters' blocks and objects requiring great lateral tenacity.

Persimmon (*Diospyros virginiana*).—The heart-wood is dark-colored, compact, hard, and elastic; it is used in the Southern States for screws, shafts of chaises, and various implements.

American Mountain Ash (*Pyrus Americana*).—The wood is fine-grained, hard, and takes a good polish; of use in tannery. It may be readily stained almost any color.

Poison Sumach (*Rhus venenata*).—This most beautiful plant of the swamps rarely grows of size sufficient to be available for its wood; some larger species have a soft, close-grained wood, of a satiny texture. Some persons are so susceptible to its poisonous influence, as to be poisoned by the air blowing from it, or by being near where it is burning; while others handle it, and even chew and swallow the leaves with impunity. The painful swellings and eruptions caused by it are said to be greatly benefited by a decoction of the root of the Indian poke (*Veratrum viride*). It may one day be valuable for the preparation of a varnish similar to the famous varnish of Japan, which is obtained from a species of sumach; the poisonous property disappears by boiling or evaporation.

Wild Plum (*Prunus Americana*).—The wood is hard and fine-grained, and takes a good polish.

Poplar (*Populus*).—The wood of all the species is soft and light, of a white or pale-yellow color. It is not much used in the arts, except in some departments of cabinet and toy-making, and for boarded floors, for which it is well adapted for its whiteness, the ease with which it is cleaned, and the difficulty with which it takes fire. It is generally considered not durable, but when it is kept dry it is exceedingly durable.

Thorn (*Cratægus*).—The wood is yellowish-white, heavy, close-grained, hard, and difficult to work. Though of small size, and liable to warp, the hardness and fine polish which it takes render it useful for canes, handles of small hammers and tools, and sometimes for wedges. Its principal use is in the formation of hedges.

Sassafras-tree (*Sassafras officinale*).—The wood, though brittle in the young tree, when thoroughly seasoned combines lightness and toughness in a high degree; it is soft and close-grained, and resists decay for a long time when exposed to the weather; its odor is supposed to keep off worms and insects, for which reason it is sometimes made into bedsteads and clothes-drawers.

Palmetto, or Cabbage-tree.—This wood is much used at the South for wharves, being secure under water from injury by the sea-worms. It is also a good material for forts, as it closes without splitting on the passage of a cannon-ball; it was much employed for this purpose during the War of Independence.

Yellow-wood, or Osage Orange (*Maclura aurantiaca*).—The wood resembles satin-wood, of a rich saffron-yellow color; from its fineness and elasticity, it is used by the Indians for their bows, hence called Bow-wood. It is very hard, and rivals the oak in its durability as ship-timber. It makes excellent hedges, as it is thorny and free from insects.

American Nettle-tree (*Celtis occidentalis*).—Has wood extremely compact, intermediate, if it be at all like the European tree, between the oak and the box, for density and hardness; it takes a fine polish, and, when cut obliquely, resembles satin-wood. The young branches are tough and elastic, and make excellent whip-handles, ramrods, and canes.

The Planer-tree (*Planera ulmifolia* and the *P. Richardi*) has a very beautiful, hard, heavy wood, finely veined, and taking a high polish; surpassing oak in durability, and never becoming worm-eaten.

The Sweet-Gum (*Liquidambar styraciflua*), of the Southern States, is said also to be worm-proof, when exposed to water for many years; it grows to be a very large tree, and is extremely difficult to split. It is a very valuable wood.

The wood of the Holly (*Ilex opaca*) is very close-grained and compact, and of a satiny texture; the sap-wood is white, the heart-wood brown. When seasoned, it is very hard, and susceptible of a high polish. As much as can be obtained is used for turning, for screws, by engravers, whip-makers, and cabinet-makers.

The wood of the Mountain Laurel (*Kalmia latifolia*) is so close-grained and hard that it is substituted for box in engraving, the handles of tools, screws, and musical instruments.

The Horse-Chestnut (*Æsculus hippocastanum*), though one of the largest and handsomest trees, is comparatively useless for its wood.

There are many valuable timber-trees in Oregon, California, and in the neighborhood of Key West, whose value must soon be acknowledged; as the Oregon Ashes, Zanthoxylum, Coccoloba, Sapotilla, Dog-Wood, Crescentia, the Western Yew, the Thuja gigantea, &c.

Mahogany, of which there is a magnificent specimen sent from Hayti, is the wood of *Swietenia mahogoni*, a native of the West Indies, and the country around Honduras; the Spanish and the Honduras are believed to be products of the same tree, growing in a different soil; the Spanish is considered the best, being the closest grained, darkest in color, and the hardest. When it grows in a poor soil, the tree is apt to be contorted, forming the variety, "Madeira wood," so much sought after in the Bahamas. Five specimens of the mahogany have been obtained from East Florida. The value of this wood depends not so much on its color, as on its hardness, and its not shrinking and warping for an indefinite length of time; hence it is always used in works requiring great permanency of form. It is the best to cut into veneers, as it holds glue better than any other wood. Its properties are too well known to need ample details.

Lignum-vitæ (*Guaiacum officinale*) is another well-known hard and heavy wood of America. When first cut, it is soft and easily worked, but becomes intensely hard on exposure to the air. The wood is cross-grained, and contains a great quantity of resin, which makes it very durable in water. It is used in machinery wherever much friction is required, and wherever hardness and strength is necessary. The fibrous structure of the wood is very remarkable, the fibers crossing each other very obliquely; it can hardly be split, and can only be divided by the saw; its fracture resembles more that of a mineral than of ordinary wood. Chips will burn freely from the amount of resin they contain.

Rose-wood is generally brought from Brazil, in the form of large slabs, or halves of trees; the colors vary from light hazel to deep purple, and nearly black, with the colors sometimes finely contrasted. It is very heavy, sometimes fine, and at others coarse-grained, and generally very hard. Next to mahogany, it is the most used in cabinet-work and upholstery. It is sometimes called Jacaranda, or Palisander, in Europe, from the belief that it is from a species of jacaranda. Dr. Lindley supposes it is produced by a species of *Mimosa;* but it is quite certain that the real tree which produces it is, as yet, unknown, except to the native residents.

There are many other woods much used for ornamental purposes, of which the principal may be briefly enumerated:—

Acacia, called *Sabien* in Cuba, is a heavy, durable wood, of the red mahogany character, much esteemed in ship-building. In the English Admiralty Museum are to be seen specimens of the original timbers of the "Gibraltar," of 80 guns, launched in 1751; some of the wood is now in such perfect condition that it has been proposed to use the old keel for that of a new frigate. The *A. latisiliqua*, of the Bahamas, is next in general value to mahogany, and it excels it in its shining satiny tints.

Box-wood (*Buxus sempervirens*) is found throughout Europe, and especially in Turkey. This yellow wood is used for musical instruments, chucks for lathes, and is preëminently the wood of the engraver; it is also much used for rules and drawing-scales.

Jamaica Box-wood, so called, *Schaffera buxifolia*, grows in Florida, and is easily mistaken for true box, for many of whose uses it is fit.

Coromandel, or Calamander (*Diospyros nirsuta*), is the produce of Ceylon, and the coast of India; it comes between rose and zebra-wood, the color of the ground being a deep brown, with black stripes; it is very hard and turns well, and is a very handsome furniture-wood.

Ebony, the produce of different species of *Diospyros*, is generally known as of three kinds; the Mauritius, the East Indian, and the African. The Mauritius ebony is the blackest and finest grained, as well as the hardest and most beautiful, but it is the most costly and unsound; the East Indian is less wasteful, but of inferior color and coarser grained; the African is the least wasteful, but the most porous, and the poorest in color. They are all used for cabinet, mosaic, and turnery works; for flutes, handles of knives and surgical instruments, &c.; piano-forte keys are usually made of the East Indian variety; the African variety is the most permanent in shape, and is the only kind used for the best sextants.

Kiabooca, or Amboyna Wood, from the East Indies, appears to be an excrescence, resembling the burs on the yew-tree; it is quite hard, and full of small curls and knots, which give it a very ornamental character when polished. The color is from orange to chestnut-brown.

Manchineel (*Hippomane mancinella*), of the West Indies, has a wood of a yellowish-brown color, beautifully clouded, resembling marble, of a close, hard, and durable texture. It is used for similar purposes as mahogany. The sap of the tree has poisonous properties.

Teak-wood is the produce of the *Tectona grandis*, a native of the coasts of Malabar, Java, Ceylon, and Tenasserim. The wood is light and porous, and easily worked, but yet strong and durable; it is oily, does not injure iron, and shrinks but little in width. It is of a light-brown color, and is esteemed in India the most valuable timber for ship-building and house-carpentry. It contains much silicious matter, which is very destructive to tools.

Zebra-wood is the produce of the Brazils. The color is orange-brown and dark-brown variously mixed, generally in straight strips; whence its name. It is much esteemed for cabinet-work, and is a very handsome wood. It is ranked intermediate between rose-wood and mahogany, and forms a fine contrast with either of them. The genus is not positively ascertained.

The above are all the principal woods used in the arts for use or adornment, which are represented in the Exhibition.

From the immense and daily increasing consumption of timber in ship-building, in the construction of bridges, railroads, &c., some process must soon be generally adopted for preventing its well-known rapid decay when exposed to moisture and the attacks of insects. Upon the sea, according to the documents of the English Admiralty, a ship lasts fourteen years in time of peace, and eight in time of war; in some climates, the ravages of the ants are such that a very few months is sufficient to destroy wood which has required a century for its growth. In some old buildings, as at Nineveh, in Egypt, and even old cathedrals and churches in Europe, the durability has been extraordinary; and it does not appear that the timber has been submitted to any other preparation than a thorough seasoning. In constructions on land, previous seasoning need not always be complete, as the wood may dry after it has been put in place; but in ship-building, timber will decay very speedily unless properly seasoned, on account of the manner in which it is inclosed, and its exposure to moisture.

The causes of rot and decay in wood are chemical, and must be guarded against by chemical means. Decay may take place under two conditions, viz., in a moist condition, with free access to air, and under water, where the access of free oxygen is prevented; and the products of decomposition are different. The decay of wood is essentially a process of oxidation:—in the first case, with the free access of oxygen, a slow oxidation, or *eremacausis*, takes place; the wood loses carbon, hydrogen, and oxygen, carbonic acid and water being formed; the process being one of slow combustion:—in the second case, the order of decomposition is changed; carbonic acid is evolved, but the hydrogen of the wood remains behind. In the decay of wood in contact with decomposing vegetable matter, the carbon of the wood is shared between the hydrogen and oxygen, the products being light carburetted hydrogen and carbonic acid and water.

The albumen which wood contains is intimately connected with its decomposition; being a nitrogenized substance, it is highly putrescible; it is also adapted for the food of insects, which penetrate the wood, thus increasing the facilities for the introduction of air and water, to accelerate decomposition. Those woods which contain the smallest quantities of this albumen, and amylaceous matters upon which it can act as a ferment, are the most durable; thus the wood of the acacia, containing merely a trace of albumen, will remain perfect for nearly twenty years, in cases where oak will decay in two.

Decay has not only to be guarded against, but also the attacks of worms, the growth of fungi, and the dangers of fire. These are distinct objects of research, and require different means as remedies. Oils, for instance, which, as a class, prevent the attacks of sea-worms, render wood more inflammable; the sulphates of alumina and lime, while they render wood more durable, also render it less inflammable; and sulphates of iron and copper prevent the growth of fungi, which often accompanies dry-rot.

The "sea-worms," so called, which are so destructive to wood, are the *Teredo navalis*, and the *Limnoria terebrans*. The former is a small mollusk, which bores into the interior of timber in salt water; its ravages are very rapid, and continued till the wood is a mere shell. Being low in the animal scale, it is very tenacious of life, and proof against agents which would speedily destroy higher animals; various chemical matters have been tried, but they have failed as a general thing, probably because they were neutralized by the action of salt water; mechanical means, and the galvanic action of different metals, have been tried without much practical advantage. Creosote seems to be a complete preservative against their attacks. The Limnoria is a minute crustaceau, resembling a wood-louse, which attacks the outside of timber in salt water. Among the earliest substances proposed for the preservation of wood was the sulphate of copper, by Dr. Hales. In the process patented by Mr. Margary, in 1837, the wood, previously dried, was soaked in a solution of one pound of sulphate of copper in five gallons of water, and allowed to remain two days for every inch of its thickness. Instead of this, a pound of the acetate of copper in fourteen quarts of water, with two quarts of crude pyroligneous acid, has been used. Sulphate of copper, like most of the metallic salts, acts by coagulating the albumen, and forming an indissoluble combination with it. Sleepers impregnated with this have been in use for six years, and are still sound; it has been applied by the aspirative process, so successfully employed by Dr. Boucherie, in which it advances about a meter in twenty hours; after passing through the wood the liquid is nearly colorless.

Sulphate of iron was found equally efficacious in checking dry-rot. An objection to this, and especially the persulphate, has been suggested by M. Bréant, that, from the decomposition into the insoluble subsulphate and free sulphuric acid, the wood is rapidly corroded; but this is said to be prevented by the previous introduction of some oily matter into the pores. Trees possessing tannin and gallic acid, as the oak, elm, chestnut, ash, are best impregnated with the salts of iron; while the resinous trees, as the pines, are but little affected by their antiseptic properties.

From the long-known durability of wood in alum-works, the sulphate of alumina has been used as a preservative; this prevents the decomposition of the albumen, but it is liable to the objection of the disengagement of free sulphuric acid. This might be obviated by using the soluble subsulphate (basic alum), and, if made without an excess of alkali, this might prove an efficient application.

The durability of wood in salt-works and mines, and of ships employed in the salt trade, would point to the use of this substance in the preservation of timber. From the deliquescent nature of the salt of commerce, this could hardly be used with advantage for general purposes.

Seasoning, by means of lime, was tried some years ago in England, but found to be worse than useless; alkalies and alkaline earths accelerate the decay of wood, by enabling its constituents to absorb oxygen, which otherwise they could not.

Arsenic might perhaps be a valuable preservative, but its injurious effects on the workmen will prevent extended trials.

Exposure to the acids arising from burning wood has been tried in Russia and in this country; though it will answer for many common purposes, it will not for naval constructions, from the rapidity with which iron, driven into wood thus prepared, is corroded.

The most ancient mode of preserving wood, and one of the most effectual, consisted in the application of some resinous or oily covering, by which air and water are effectually excluded; if the wood be perfectly dry and sound, and not exposed to abrasion, this would be the easiest, cheapest, and most effectual method. This method has been recently proposed by MM. Hutin and Boutigny, in the Annales de Chimie et de Physique (3d serie. vol. 23, 1848). They dry the ends, by slight combustion from any carburet of hydrogen (as naphtha), which is very penetrating; after this they dip the ends in a warm mixture of pitch, tar, and gum lac, which hermetically seals the ends; the wood is then tarred all over as usual, and has been found very durable for railroad-sleepers. By these agents are avoided the expense of corrosive sublimate—the danger of arsenic—the deliquescence, and alterative action from the disengagement of chlorine, of the chlorides of calcium, sodium, and zinc—the evils from the disengagement of sulphuric acid, and other disadvantages attending the use of the sulphates of copper and iron, to be alluded to hereafter.

From the smell of creosote, an objection has been raised to its use in naval constructions; other oils, as train oil, lard oil, have been suggested. That oil of some kind will be valuable, may be inferred from the fact that teak and greenheart, two of the most durable woods, and free from the attacks of sea-worms, contain naturally a large quantity of oil.

It would be desirable to ascertain whether the long duration of wood depends on the bringing closer together its fibers, or otherwise excluding moisture—on washing out impurities, or on chemically decomposing those matters and rendering them innocuous. There can be no doubt that mere mechanical action has considerable beneficial effect; even simple dessiccation brings the fibers closer together; impregnation with oils, and the introduction of many metallic salts, also act mechanically, by filling up the pores of the wood. As chemical changes take place in the contained juices, ordinary water-seasoning tends to preserve timber, by washing out matters susceptible of fermentation. The principal means, however, for increasing the durability of wood, are chemical; and of the processes employed, the following deserve mention: Mr. Kyan's patent, of 1832, for impregnating with corrosive sublimate; Sir William Burnett's, in 1836, for injecting chloride of zinc; Mr. Payne's, in 1841, for impregnation with metallic oxyds and alkalies; Mr. Bethell's, in 1838, for impregnation with creosote and oil of tar; and Dr. Boucherie's aspirative process for introducing the pyrolignate (or impure acetate) of iron.

Corrosive sublimate has proved in many cases an excellent antiseptic, but it is more expensive than equally efficacious agents. Mr. Kyan proposed it (though it had been previously suggested by Sir Humphrey Davy) as a preventive of the dry-rot, under the idea that it would destroy the fungi and insects, which are now known to be, not the cause, but the frequent consequence of dry-rot. Its action depends on its forming an insoluble compound with the vegetable albumen, which is thus rendered unsusceptible of undergoing spontaneous decomposition and of exciting fermentation. In this process, the wood is sawed into blocks and planks, and immersed for about a week in a solution

containing one pound of the corrosive sublimate to five gallons of water; this may be effected in an open tank. Sir Samuel Bentham, as early as 1794, perceiving that the principal obstacle to the introduction of preservative fluids into wood was the air contained in it, conceived the idea of exhausting the air by means of an air-pump apparatus; to this was soon added a contrivance for injecting the fluids under strong pressure, sometimes with a force of 150 pounds to the square inch. The efficacy of Mr. Kyan's process was tested at the Royal Arsenal at Woolwich; pieces of prepared and unprepared timber were placed in contact with putrefying vegetable matter, and with wood affected with dry-rot, at a somewhat increased temperature; the Kyanized wood was found unaltered at the end of five years, while the other was considerably affected before the end of the first year.

Sir William Burnett's process consists in impregnating the wood, or other vegetable substance, with a solution of chloride of zinc, containing one pound to five gallons of water. Under common atmospheric pressure, the time required is from ten to twenty days; the timber should be dried in a sheltered situation, and it is well to cover it with a paint composed of oxyd of zinc and drying oil. The protection from this substance is equal to that from corrosive sublimate; and it is better for shipping, as the compound of oxyd of zinc with albumen is not soluble in sea water like the mercurial compound. Specimens of oak, elm, and fir, remained perfectly sound in the test-pit at Woolwich, above alluded to, for five years; the protection to canvas and cordage is greater than that from the corrosive sublimate. This liquid is also applied more speedily and effectually under strong pressure; the apparatus at the Portsmouth (England) dock-yard consists of a cylinder fifty-two feet long, and six feet in diameter, holding about twenty loads of timber; there are affixed a set of exhausting-pumps, and a set of pressure-pumps, and a pressure of 200 pounds to the square inch has been tried in it.

Payne's process, by the double decomposition of sulphate of iron and chloride of calcium within the pores of the wood, is as follows: The pieces of timber are introduced, on a kind of sledge, into a long cylindrical iron vessel, the cover of which is then screwed on tight; steam is then admitted, first to drive out the air through a valve opened for the purpose, and then to form a vacuum, which partially occurs when a little cold solution is pumped into the vessel by the steam-engine to condense the steam; the vacuum is completed by an air-pump; the liquid flows in as the air is exhausted, and is finally subjected to pressure by force-pumps worked by the steam-engine; this fills all the pores of the wood with sulphate of iron. After a few minutes the sulphate is allowed to flow out by the readmission of air; the vessel is again heated with steam, and is similarly filled with chloride of calcium. Double decomposition instantly takes place in the pores of the wood, forming chloride of iron and sulphate of lime, or gypsum; the latter is said to remain principally in the pores, while the former pervades the wood generally. The whole process takes from one to three hours, according to the size of the timber. The wood becomes much heavier, indisposed to decay, less combustible, darker in color, and proof, to a greater or less extent, against rot and the attacks of insects. It is used principally for railways, buildings, piles, and wet foundations.

It is hard to say whether the efficacy of this process depends on mechanical or chemical causes; if it depends on the formation of crystals, it is certainly mechanical; if on the action of either of the fluids introduced, since both may act chemically on the pieces of the wood, it is strictly chemical. From the instantaneous manner in which the double decomposition takes place, we are inclined to think that the formation of the sulphate of lime, at the moment of introduction of the second substance, prevents the decomposition of the sulphate of iron, except at the very beginning of the process; and that the real preservative agent, after all, is the sulphate of iron, aided, on the end of the piece of timber, by the obstruction of the pores by the sulphate of lime. Whichever be the case, the process is open to the objection that all such crystals must separate the fibers to a greater or less extent, according to the amount of liquid forced in, and render the wood to that extent permeable to the causes of decomposition; and if the sulphate of iron be the preservative agent, this will be gradually dissolved, or it will be decomposed, and free sulphuric acid will accelerate the decay of the wood.

Dr. Boucherie starts from the principle that all the alterations of wood depend on the soluble matters which it contains, which either serve as food for worms, or give rise to fermentation. He found that sound timber contained from three to seven per cent. of these matters, while decayed wood contained only from one to two per cent.; thence his idea was to remove these matters, or render them insoluble by some metallic salt or earthy chloride. After many experiments on very perishable vegetable matters (detailed in the Journal of the Franklin Institute for 1841, Vol. 2), he arrived at the conclusion that the impure pyrolignate (or acetate) of iron was the best, for the following reasons: It is cheap; its oxyd forms stable combinations with almost all organic matters; its acid has no corrosive properties, and is volatile; lastly, according to him (which is, however, doubtful), it contains the greatest proportion of creosote which an aqueous liquor can dissolve; he found that one-fiftieth part of the weight of the green wood was more than sufficient for complete protection. Though giving this preservative the preference, he allows that the chlorides of calcium and sodium, when the wood is not constantly in the water, are equally efficacious.

Having satisfied himself that ordinary maceration, and previous rarefaction of the air in the wood, were incomplete means, he ascertained that the force which circulates the sap in the living tree might be used to impregnate trees with various solutions after they were felled; a tree, within a suitable time after it is felled, having its foot immersed in a saline solution, will soon be permeated by the liquid, through the force of absorption, even to the terminal leaves—a poplar tree ninety feet high, immersed to the depth of eight inches in the pyrolignate of iron, was entirely impregnated with the liquid in six days, absorbing 3½ cubic feet. He pierces the stem through and through, opening the principal sap-tubes at the base, and leaves only enough of the tree to sustain it in an upright position; the greater part of a tree may be penetrated, notwithstanding the removal of most of its branches, if the terminal foliage be preserved; the sooner the operation is commenced after felling the better, as the absorption begins to decrease after the first day, and is scarcely perceptible on the tenth, ten days being sufficient for complete impregnation. The quantity absorbed is sometimes enormous, as much as ten cubic feet of chloride of calcium, or seven of the pyrolignite of iron; the less quantity of the latter being doubtless due to its astringent properties; the neutral salts are always absorbed in large quantities, the acids and alkaline salts sparingly.

In the white woods there is a central tube, of variable diameter, which resists impregnation; this, having no longer life, as the circulation has ceased in it, is not impregnated; so in the central parts of the heart of oak, elm, &c.

This salt of iron, while it preserves, also hardens timber to such a degree that it presents twice its usual resistance to cutting-instruments.

The flexibility and elasticity of wood, so important in naval constructions, which he thinks due to a certain amount of moisture retained, was increased in a remarkable manner by the chloride of calcium and other deliquescent salts, and even by the stagnant waters of salt-marshes; the degree of elasticity depending on the strength of the solution introduced. He thus was able to twist the most brittle pine into a complex helix, which would instantly return to a straight line when the force was relaxed; and this property remained at the end of eighteen months. For greater security, he adds one-fifth of the pyrolignite of iron; wood thus prepared takes paint and varnish as well as ordinary wood.

Mr. Hyett thinks that the flexibility of wood does not, in all cases, depend on the presence of moisture. Pieces of larch, impregnated with acetate and sulphate of copper, he found more flexible than a piece impregnated with chloride of calcium. From his experiments, it appears that the *strength* of wood is most diminished by impregnation with those substances which most increase its *flexibility*. Resinous and non-resinous trees require different treatment; in beech, and probably in all non-resinous trees, prussiate of potash and pyrolignite of iron are the only agents which do not impair the strength of the wood in its natural state; while, in the larch, prussiate of potash and sulphate of copper are the only substances which do not increase its strength. Prussiate of potash gives the greatest strength to the beech, and produces no alteration on larch; sulphate of iron diminishes the strength of beech, but increases that of larch; sulphate and acetate of copper also diminish the strength of beech, but not that of larch. From the action of sulphuric acid, the acetates of iron and copper are better for beech than the sulphates; corrosive sublimate produces the same effect on larch as on beech; the pyrolignite of iron is the best single material for both kinds of trees, but prussiate of potash is the best for beech, and chloride of calcium for larch.

The warping and splitting of wood, due, principally, to the alternate giving out to, and receiving moisture from the air, is prevented by impregnation with a weak solution of the chloride of calcium, to which one-fifth of the pyrolignite is added.

The process of Dr. Boucherie, above described, is the same as the one patented by Mr. Bethell in England two years before. There can be no doubt of its great advantages. This method was favorably reported on by a commission of the French Academy, consisting of MM. Dumas, Boussingault, De Mirbel, Arago, &c.; and extensive arrangements were undertaken by the Minister of the Marine for its application in the French Navy.

In order to apply a preservative process at all seasons of the year, Dr. Boucherie now impregnates timber with sulphate of copper, pyrolignite of iron, and chloride of calcium, by means of a column of the liquid communicating with a reservoir cut in the center of the log, from which it passes readily through the whole extent. He has thus prepared many thousands of railway-sleepers with sulphate of copper, which have been down on the great Northern Railway of France for five years, and are now perfectly sound, while others on the same line, not prepared, are completely destroyed.

Various processes have been employed for rendering timber fire-proof. Impregnation with the chloride of zinc will render wood, and even linen, so incombustible that even in a most intense fire it will not be charred, only bursting into flame.

Mr. Payne has taken out a patent for introducing, under pressure, sulphuret of barium and calcium in solution, and afterwards a solution of sulphate of iron, to fix the salt of barium and calcium. The earthy chlorides, as introduced by Dr. Boucherie, render wood inflammable with difficulty, by fusing on the surface, and cause it to burn with great slowness. Mr. Bethell has recommended the soluble glass, silicate of potash, for fusing on the surface, and giving a protective filmy coating.

Mr. Maugham's patent consists in dissolving phosphate of soda and muriate or sulphate of ammonia together, and then submitting the wood, previously dried, to this, under strong pressure; it is best to cut the wood into planks first. Twelve hours are sufficient for the process. He gives, as the best proportions, 176 ounces of crystallized phosphate of soda, and 54 ounces of muriate of ammonia, to 2½ gallons of water; the clear solution is drawn off for use; the wood, when dry, is fit for use.

The above salts are too expensive for extensive use. The best and the cheapest is the sulphate of ammonia, which is protective by the coating of sulphuric acid, which requires great heat to volatilize; and by sulphurous acid and the sulphate of ammonia, under very great heat.

The great objections to the introduction of any of the metallic salts above described are: the forcing asunder the fibers of the wood, by the formation of crystals, and thus rendering it liable to decay if placed in the water—these salts not being able to seal the pores of the wood, the fiber is still exposed to the slow process of oxydation, erema-

causis—they are objectionable where iron has to be driven into the wood, as the acids act upon and destroy it—and the great objection is, that when the albumen is coagulated by them, the woody fiber is still exposed to the attacks of the marine worm and the white ant, it being a property of albumen to render innocuous corrosive sublimate and other poisons combined with it.

To obviate these objections, Mr. Bethell uses a material obtained from the distillation of coal-tar, consisting of bituminous oils, combined with a portion of creosote. This coagulates the albumen, gives a water-proof covering to the timber, and completely protects it against the attacks of the worm and the ant.

This substance is applied to the timber, previously exhausted of its air and moisture, either under strong pressure in a vacuum, or by immersion in a hot solution. Timber thus prepared is called "creosoted timber," though, strictly speaking, the material contains carbonic acid, or phenole, which has been generally confounded with creosote; it undoubtedly does contain, however, a portion of creosote, so that the name may be retained, with the above explanation.

One gallon of oil of tar is necessary per cubic foot for bridges and piers, and the increase by weight ought to be ten pounds per cubic foot; the cost of saturation is about twelve cents per cubic foot; for railway-sleepers, about eight pounds of oil of tar, at about nine cents per cubic foot; a penetration of two or three inches deep is generally enough. Where expense is no matter for consideration, wood might be first subjected to Sir William Burnett's process, and then be creosoted, which would render it indestructible.

This system has been practiced on several railways in England for several years. On the London and Northwestern Railway, creosoted sleepers have been in use eleven years without any signs of decay; also on the Stockton and Darlington, and on the Lancashire and Yorkshire Railways, for from five to ten years. In a trial made in Gloucester, for the last twelve years, unprepared timber decayed in one year, Kyanized in seven, while the creosoted is as sound as when first put down.

This timber is especially valuable for piles of bridges and piers. At the January Meeting (1853) of the Institution of Civil Engineers, the President exhibited specimens of unprepared, Payneized, and creosoted timber, from the Southampton Royal Pier, placed only four years ago; the first two were completely disintegrated by the marine worm, the latter was perfectly sound. At Lowestoft Harbor, and at the Isle of Portland, creosoted piles have remained sound, now, for more than five years.

Some woods take up more oil of tar than others: for instance, fir more than oak; beech is the best wood, as it will receive a greater quantity than any other wood, from its many pores.

The ravages of ants (*Germes lucifugum, R.*), which, in some villages of France, riddle the woodwork of houses from the foundation to the roof, may be prevented, according to M. Quatrefages, by the use of chlorine and nitrous vapors. As their name implies, these creatures leave the surface of the wood untouched, and apparently sound, working out of sight; wood should be submitted to these vapors before using it.

The great objection to the use of creosote on land is the danger of fire; and this would apply to other oils, as lard-oil and whale-oil, which would be equally effective, cheaper, and less offensive; the latter would not do so well to protect against the worm.

Of the processes, that which promises best on land seems to be that of Sir William Burnett, which is quite protective against ordinary causes of decomposition, and against fire; and for the water, the saturation with the oil of tar.

From the costliness of many ornamental woods, various processes have been devised to stain, more or less permanently, the softer woods, in imitation of those unattainable except at great expense. Attempts have been made to stain wood during its growth, by immersing certain portions of the roots in vessels filled with coloring matters; of course, this has only been undertaken for a space of time short, compared with the entire life of a tree, and it is not to be expected that any very permanent results will in this way be effected. Much more may be hoped from the introduction of coloring matters after the seasoning of the wood, under high pressure, as described in some of the preservative processes, or by immersion in hot solutions of coloring matters.

Both mineral and vegetable materials are used in the artificial coloration of wood; the former are generally the most permanent, and, when caused by chemical decomposition within the pores, are also preservative to a greater or less extent. The naturally light colors of woods are rendered darker by being covered with oil or varnish, though the latter somewhat checks the change into the deepest hues; the yellowish color of most varnishes seriously interferes with the colors of light and delicate woods, for which the whitest kinds should alone be used. In many cases, the colors of the woods are modified by applying coloring matters, either before or with the varnish; in this way, handsome birch-wood may be made to assume the appearance of mahogany, so exactly as often to escape detection.

A *yellow* color may be given to wood by boiling-hot solutions of tumeric, Persian berries, fustic, &c.; the color is very fugitive; a more permanent color results from nitric acid, and best of all, by the successive introduction of acetate of lead and chromate of potash; sulphate of iron also stains timber of a yellowish color, when used as a preservative agent, so much so that it is recommended to use corrosive sublimate for this purpose when it is desirable to preserve the white color.

A *red* color may be obtained by immersion in a boiling-hot infusion of Brazil-wood, and afterwards washing with alum-water; also by a tincture of dragon's-blood. An orange-red color may be obtained by the successive action of bichloride of mercury and iodide of potash, madder, and ammoniacal solutions of carmine.

Blue is obtained by hot solutions of indigo, of sulphate of copper, and by the successive introduction of pyrolignite of iron and prussiate of potash.

Green is the result of the successive formation in the pores of the wood of a blue and a yellow, as above indicated, and by a hot solution of acetate of copper in water. A yellowish-green may be obtained by the action of copper salts on the red prussiate of potash.

Purple is generally obtained by immersion in a boiling solution of log-wood and Brazil wood, one pound of the former and one-quarter of a pound of the latter, to a gallon of water.

Dark-brown is the result of the action of copper salts on the yellow prussiate of potash; the sulphate of copper, in soft woods, gives a pretty reddish-brown color, in streaks and shades, which is rich after varnishing, and said to be permanent. A mahogany color is obtained by different proportions of madder, log-wood, and Brazil-wood.

Black is obtained by immersion in a hot decoction of log-wood, and afterwards in a solution of galls; this will take a fine polish; and by a solution of copper in nitric acid, and afterwards in a decoction of log-wood.

Since the researches of Dr. Boucherie on the aspirative power possessed by trees, coloring matters have been introduced with ease; those most easily applied are such as are produced by double decomposition between the substances in solution, one being introduced after the other. For instance, a black tint may be produced by introducing successively solutions of sulphuret of sodium and acetate of lead, whereby the black sulphuret of lead is formed; a similar color may be formed by an infusion of galls and the pyrolignite of iron. A green (Scheele's green) may be produced by acetate of copper and arsenious acid; a solution of sulphate of copper, with a slight excess of ammonia, penetrates wood easily, producing an agreeable blueish tint. As the coloring does not affect equally all parts of the wood, the tints are in waves and veins, which are very beautiful when the wood is polished.

According to Mr. Hyett, different solutions penetrate with different degrees of facility; in applying, for instance, acetate of copper and prussiate of potash to larch, the sap-wood is colored most when the acetate is introduced first; but when the prussiate is first introduced, the heart-wood is the most deeply colored. Pyrolignite of iron causes a dark-gray color in beech, from the action of tannin in the wood on the oxyd of iron; while, in larch, it merely darkens the natural color. Most of the tints, especially those caused by the prussiates of iron and copper, are improved by the exposure to light, and the richest colors are produced when the process is carried on rapidly.

Vegetable coloring matters do not penetrate easily by the aspirative process, probably on account of the affinity of the woody fiber for the coloring matter, whereby the whole of the latter is taken up by the parts of the wood with which it first comes into contact.

Different intermediate shades, in a great variety, may be obtained by combinations of coloring matters, according to the tint desired and the different ideas of the dyer.

When it is desired to give to wood recently worked the appearance of that which has become dark from age, as is often the case in repairing antique furniture, it is generally effected by washing it with lime-water, or by putting on the lime as water-color, and allowing it to remain a few minutes, hours, or days, according to circumstances.

Further details are incompatible with the object of this article. That wood is a material well adapted for decorative art is abundantly proved by the fine carvings and splendid furniture in the Exhibition.

Wood-carving, as far as the object to be gained is concerned, is, to all intents and purposes, sculpture; varieties of color cannot usually be made elements of beauty in this art, the whole effect being produced by varieties of form.

From the softness and abundance of the material, wood, this art must have been the first practiced by man; even the most barbarous races have their rude and grotesque figures carved from wood by sharpened stones; from these rude beginnings, through the artistic carvings of the middle ages, in the days of the pride and power of the Church of Rome, to the more elaborate and exquisitely finished specimens in the Exhibition, we perceive a progress, not so much in artistic ability as in the superior construction of tools; for in this art, more perhaps than in any other, must the execution of the work depend upon mechanical dexterity arising from, or aided by the employment of superior cutting-instruments.

The ancient carvings were mostly of a religious character, consequently there was less room for complicated design and florid execution than at the present time, when this mode of decoration has become very general in the ornament of household articles of luxury, and in the exterior and interior of private and public buildings.

Some of the specimens are so overloaded with ornament as to be entirely inappropriate for their intended uses; we do not allude to such for purposes of criticism, but merely to show to what extent wood may be rendered subservient to purposes of decoration. Some of the most beautiful specimens of wood-carving are the panels representing flower-pieces and the instruments of the chase (figured and described on page 66 of the "Illustrated Record"), executed by W. G. Rogers, of London—the Ebony Cabinet, exhibited by R. J. Gamelkow, of Holland (figured on page 62 of the Record)—the carved black walnut articles made by A. Ellaers, A. Roux, and Herter, and the carved oak by Bulkley & Herter, and Charles F. Hebe & Son, in the United States Department—the cabinet-work, from A. E. Ringuet, Leprince & Co., Paris and New York—and the Console Table, exhibited by G. Da Fieno, of Genoa (represented on page 125 of the "Illustrated Record").

The woods which seem the best adapted for carving are oak, black walnut, ebony, zebra-wood, mahogany, and rosewood.

In decorative and furniture carving, the French and Austrians are especially successful, probably because they pursue it as a branch of art, and not as a mere trade; the head and hand of the true artist must always be present to render works of this kind any thing more than florid and, in many cases, ridiculous ornament.

Wood-carving, being done almost exclusively by hand, will always be too costly for extensive application as an art, though in great demand as a trade. The application of machinery is very limited.

SECTION II. CLASS V.

MACHINES FOR DIRECT USE, CARRIAGES, ETC.

THE present class comprises machines for direct use. They are generally called "Prime Movers," being employed to develop power, rather than apply it. The machines in this class are the necessary anteeedents of the manufacturing machines and tools arranged under Class VI. Steam-engines, water and wind mills, belong to the first section of this class—several steam-engines are shown which deserve careful attention. Some of them are employed in driving the machinery in the Machine Arcade. Separate parts of machines are also arranged under this class, as well as those which depend upon the principles of pneumatics and hydraulics. An important division is formed by the railway machinery—no locomotive engines were exhibited. Carriages for ordinary use form the last division of the class. They are represented by numerous examples, exhibiting every variety of structure and decoration.

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1. BRISTOL, RICHARD C., *Chicago, Illinois.*—Patentee and Proprietor.

Rotary steam-engine. A cylinder fastened to the shaft, which constitutes its axle, and carrying four radial sliders, which are caused to project against the interior surface of a stationary cylinder, carrying appropriate valves. When these sliders project beyond the cylinder in which they are incased, the pressure of steam against them causes the axle to revolve until it has completed a portion of a revolution, when the sliders are withdrawn to pass one of the valves, and the opposite sliders come into action on passing a corresponding valve opposite. The action of most rotary actions may be comprehended by examining an ordinary rotary-pump, and considering its action as if the water was driving the pump, instead of the pump forcing the water. In ordinary rotary engines, the sliders receive their motion from a cam, but in Bristol's their movement is occasioned by the direct pressure of the steam.

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2. LAWRENCE MACHINE SHOP, *Lawrence, Massachusetts.*—Manufacturer.

Double-cylinder steam-engine, with the respective cranks set on the same shaft, at right angles to each other; cylinders are horizontal, and are worked non-condensing and expansively; steam-chests on sides; fly-wheel is cast in halves, with curved arms, and has its hub banded with wrought-iron.

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3. HORTON, WILLIAM H., *Jersey City, New Jersey.*

Model of a working locomotive.

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4. HIGGINS, SYLVESTER B., *New York.*—Proprietor.

High-pressure atmospheric engine, upon a new principle.

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5. STRONG, BUSH & FORMAN, *Brooklyn, New York.*—Proprietors.

Highly finished model of a single and double-acting rotary-engine, with new motive power.

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6. KELLEY, GEORGE, *Kelley's Island, Erie County, Ohio.*—Inventor.

Model of rotary steam-engine, convertible into a force-pump or submerged water-wheel.

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7. WINTER, JOSEPH H., *Winter Iron Works, Montgomery, Alabama.*—Manufacturer.

Horizontal steam-engine of thirty horses' power. This engine is of an elaborate ornamental design and high finish, and has a compensating connecting-rod, but no expansion-gear. The uniform texture of the cast-iron and brass, particularly the latter, is the main point that will command the attention of a mechanic.

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8. CORLISS & NIGHTINGALE, *Providence, Rhode Island.*—Manufacturers.

Steam-engine of sixty horses' power, employed for driving machinery in the Machine Arcade. This beam-engine is well fitted, and works smoothly, and possesses a peculiar arrangement of expansive valves, which has been a subject of much litigation.

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9. BARROWS, EBENEZER, *New York.*—Manufacturer.

Model of direct and double-power reversible rotary-engine.

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10. HUTCHINSON, ALEXANDER C., *New York.*—Proprietor.

Working model of a condensing beam-engine for a side-wheel steamer.

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11. JOHNSON, JOHN R., *Geneva, New York.*—Proprietor.

Portable steam-engine; has a vertical boiler, serving as frame and standard of the engine.

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12. REYNOLDS, SAMUEL, *Smithville, New York.*—Proprietor.

Model of a water-wheel, with the paddles placed angularly across the face of the wheel; designed to diminish the force of the blow with which the paddle strikes the water.

[Similar wheels were applied and rejected by Robert L. Stevens, Esq., of New York, several years since.]

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13. HARRIS, JOSEPH, *Boston, Massachusetts.*—Proprietor.

Model of a patent steam-engine. This engine is designed to avoid the stoppage of the engine on what is technically termed the "dead center." In a beam-engine, for instance, the crank-end of the beam carries a short beam, swung from its center, at each end of which a connecting-rod depends to the cranks, set at right angles to each other on the shafts. The common center of these cranks and rods makes as objectionable a "dead center" as is obtained with the ordinary arrangement.

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14. SECOR, JAMES, *St. Louis, Missouri.*—Inventor and Proprietor.

Model of a submerged current-wheel, by which the current of any ordinary stream may be caused to perform some useful labor.

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15. WINTER IRON WORKS, *Montgomery, Alabama.*—Manufacturer.

Model of Richly's center-vent cast-iron water-wheel. The speed at which this wheel is run is said to be constant, notwithstanding the load may be removed; thus dispensing with a regulator or intermediate gearing.

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16. TOMPKINS, CALEB, *Cartersville, Georgia.*—Inventor and Proprietor.

Model of a steam-engine.

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17. CHAMBERS, CYRUS, JR., *Pennsylvania.*—Manufacturer.

Lilliputian high-pressure steam-engine.

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18. WARNER, BENJAMIN J., *London.*—Manufacturer and Exhibitor.

Miniature oscillating cylinder-engine; standing upon a silver fourpence (size of half-dime), worked by atmospheric pressure instead of steam. The diameter of the cylinder is one-sixth of an inch, the length of stroke three-eighths, the length of the cylinder less than one-half, and the diameter of the piston that of an ordinary needle. The stuffing-box is no larger than a pin's head, and is crammed with fine wool; the piston is packed with a fine film of cotton; the screw-heads are perfectly hexagonal, as may be seen by examination with a glass; the piston-rod is keyed to the crank. Within the fine tube are very minute four-way valves, and the machine will work by the imperfect exhaustion of a syringe.

Miniature beam-engine, composed of more than 200 pieces. The length of the stand is 3¼ inches, length of beam 2¼ inches, diameter of cylinder ⅜ of an inch, and length of stroke ⅛ of an inch. This is also a working model.

Also, fine duplex and lever watch movements.

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19. Vergnes, Professor Maurice, *New York.*—Inventor.

Electro-magnetic engine for motive power. It is a well known fact that mechanical power is developed by magnetism, and there have been machines invented for the purpose of applying it usefully, but none of them have gotten over the general objections which apply to all, and among which the great expense is prominent.

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20. Bodien, H., *New York.*

Drawing of a centrifugal engine, by H. L. Suart.

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21. Wright, Benjamin H., *Rome, New York.*—Proprietor.

Small working model of a revolving-piston engine, for direct application of power and uniform motion.

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22. Bryant, Samuel, *New York.*—Manufacturer.

Upright steam-engine.

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23. Mann, Charles F., *Troy, New York.*

Portable steam-engine and pump. The steam and pump-cylinders are placed in line with one another, with their rods connecting to a transverse frame, in which the crank-pin has its horizontal motion in converting the reciprocating motion of the engine into a circular motion of the shaft.

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24. Hills, Cassius A.

Rotary steam-engine.

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25. Allaire Works, *New York.*—Manufacturer.

Complete cylinder of an oscillating engine.

Original cylinder of the steamship "Savannah," which, in August, 1819, made the first steam voyage across the Atlantic.

[This exhibition of the cylinder of the "Savannah," in connection with the original logbook, &c., exhibited in Class 17, No. 88, by Mr. S. S. Ward, puts at rest any question as to American precedence in the use of steam for transatlantic voyages.

In August, 1819, the "Savannah" left the United States for England, under the command of Moses Rogers, Esq., a gentleman who is peculiarly identified with the history of steam navigation, having been captain of Fulton's "Clermont," on the Hudson, and of the "Phœnix," the first steamer on the Delaware.

Her arrival at Liverpool attracted much attention, and extracts are pasted in the log, from the London "Times" and other papers of the day, commenting on her voyage. From Liverpool, she proceeded to St. Petersburg, stopping at Stockholm to receive as passenger Lord Lyndock, who presented to the Captain a silver tea-kettle with this inscription:—

"Presented to Captain Moses Rogers, of the Steamship Savannah, being the first steam-vessel that has crossed the Atlantic, by Sir Thomas Graham, Lord Lyndock, a passenger from Stockholm to St. Petersburg, September 15th, 1819."]

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26. Metcalf, Albert W., *New York.*—Manufacturer.

Steam-valves, stop and gauge-cocks, steam-whistles, globe oil-cups and cocks, &c., for marine and stationary engines.

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27. Parker, R. W., *Roxbury, Massachusetts.*—Patentee.

Banding pulleys, exhibited in their practical application to machines in motion.

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28. Hills, Samuel C., *New York.*—Agent.

Patent steam-engine regulator, comprising governor and valve.

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29. Gilbert, Isaac I.—Manufacturer.

Machine banding.

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30. Wright, Wm., & Co., *Newark, New Jersey.*—Inventors and Manufacturers.

Car, carriage, and cart springs.

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31. Farnam, Charles N., *Norwich, Connecticut.*—Manufacturer.

Machine factory-bands.

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32. Scarlett, Joseph, *Boston, Massachusetts.*—Inventor.

Right-angled crank. A pair of roller-cams fitted in a frame, the reciprocating motion of which is changed to a rotary motion of the cam-shaft.

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33. Dibaen & Bollman, *New York.*—Manufacturers.

New and compact multiplying gear, for application to machinery where cog-wheels are employed.

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34. Ashcroft, E. H., *Boston, Massachusetts.*—Manufacturer.

Metallic steam-gauge. This invention is of French origin, and may have the principle of its action readily illustrated by coiling an ordinary hose, and forcing a jet of water through it, when it will be found that the hose is straightened in a degree proportioned to the force of the water. In the steam-gauge, a portion of a small coil of copper pipe is inclosed in the case under the dial-plate, and connected with the boiler; one of its ends is permanently fastened, and the other is left free for the action of the pressure of the steam, and is connected with an index which is shifted over the surface of the marked dial, and indicates by its vibrations the varying pressures within the pipe or boiler.

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35. Kumbel, William, *New York.*—Patentee and Manufacturer.

Machine-stretched leather banding, and the materials for its manufacture.

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36. Dorter, Edmund, *Bethelem, New Hampshire.*

Shafting-hangers, in which both brasses are loose, and shifted by set-screws.

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37. Abbott, Horace, *Rolling Mills, Canton, Ohio.*—Manufacturer.

Boiler-heads and plate-iron girders.

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38. Judson, Junius, *Rochester, New York.*—Manufacturer and Proprietor.

Regulator for steam-engines.

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39. Wood & Hunter, *New York.*—Manufacturers.

Brass cocks, valves, &c., for steam-engine connections.

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40. Berry, Horatio S., *Westerly, Rhode Island.*—Manufacturer.

Stillman's patent spring jaw-temple for looms.

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41. Westland, C. C., *New York.*—Designer.

Model of a steam-propelling engine.

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42. Munroe, Nathan, *Daysville, Connecticut.*—Inventor.

Lathe engine—seven feet.

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43. Smith, Albert M., *Rochester, New York.*—Manufacturer.

Patent machine belt-clasp. This useful and simple invention is designed to supersede the old-fashioned contrivances of laces and rivets in making machine-belts, and consists of two metal clamps, with their faces fluted to give them a hold on the belt, screwed together over the joints.

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44. Earle, T. K., & Co., *Worcester, Massachusetts.*—Manufacturers.

Machine-cards.

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45. Kendrick, John, *Providence, Rhode Island.*—Manufacturer.

Cotton-worsted and wire harnesses for machinery.

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46. Warren & Bryant, *Lawrence, Massachusetts.*—Manufacturers.

Machine card-clothing.

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47. Hill, Samuel C., *New York.*—Agent.

Patent steam-engine regulator, comprising governor and valve, fitted on a badly proportioned steam-engine.

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48. Walker, John, *Hoboken, New Jersey.*—Inventor.

Working model of a duplicate motion, by which a screw-propeller may be driven at twice the speed of the engines without the intervention of gearing.

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49. Bloodgood, William E., *Rahway, New Jersey.*—Manufacturer.

Samples of boiler-felting.

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50. Minnigs, Theodore, *Meadville, Pennsylvania.*—Inventor.

Lubricating balance-box. The weight and power of the axles are supported by floating boxes, which rotate in water or other fluid.

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51. Rose & Middleton, *New York.*—Agents.

Collins' cut-off motion for steam-engines. The ordinary eccentric is, in this invention, furnished with cogs, and drives a series of pinions which give a double motion to the valve, which may be adjusted by means of a screw.

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52. Hopper, Thomas, *Newark, New Jersey.*—Manufacturer.

Anti-friction box for journals.

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53. Burnett, W. J. & J. H., *New York.*—Manufacturers.

Patent graduating-valve forge tuyere.

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54. Wright, Hanson, *Decatur, Otsego County, New York.*—Manufacturer and Proprietor.

Loomis' improved patent forge-bellows. Combination of bellows delivering into one air-chamber, for the purpose of securing a steady blast.

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55. Cary, J. C., 48 *Courtlandt Street, New York.*—Manufacturer.

Self-adjusting rotary fire-engine, and force-pump and hydrant. [For a description and illustration, see page of the "Illustrated Record."]

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56. Jeffers, William, *Pawtucket, Rhode Island.*—Manufacturer.

Side-stroke fire-engine. [Engraved in "Illustrated Record," page .]

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57. Gay, A. W., & Co., *New York.*—Agents.

Warner's patent suction, forcing, and anti-freezing pumps.

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58. Pearce, John, & Co., *New York.*—Manufacturers.

Water-filter, in use.

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59. Van Ness & Torross, *New York.*—Manufacturers.

Side-stroke fire-engine.

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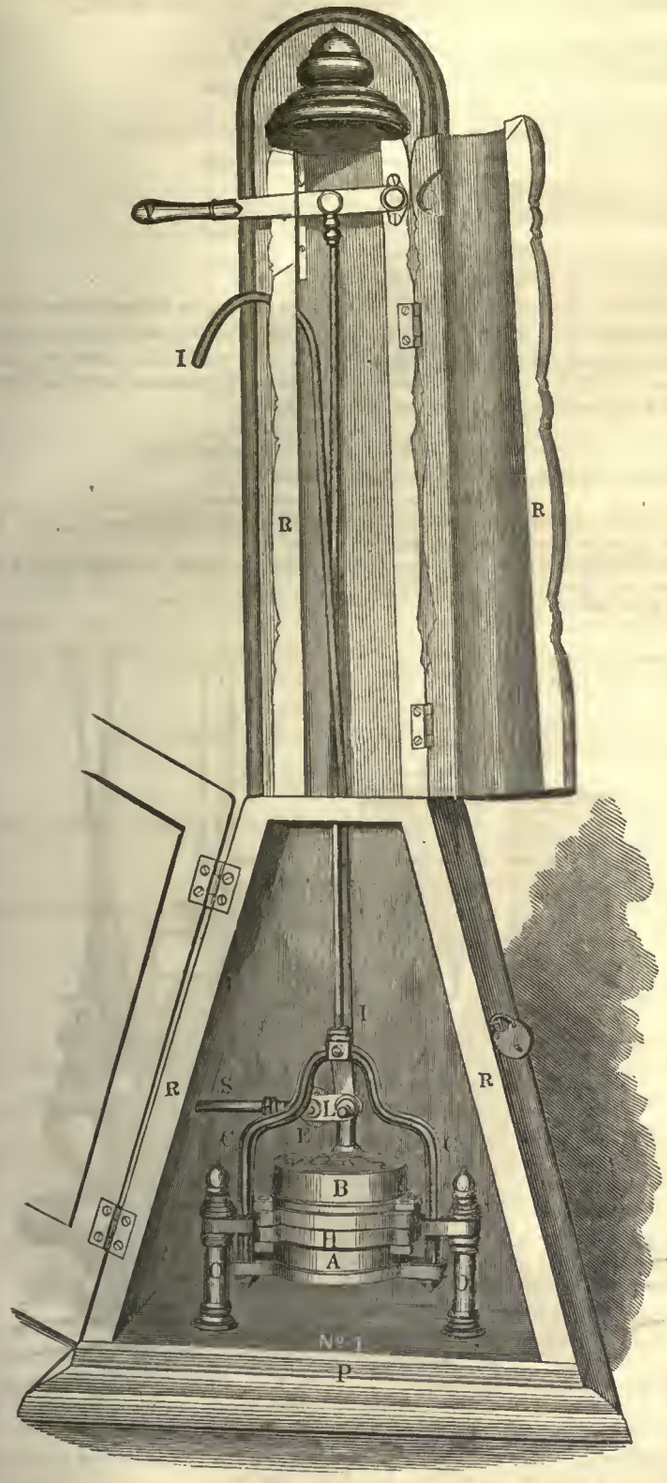
60. Eunson, Robert G., *New York.*—Manufacturer.

Hydrostatic condenser.

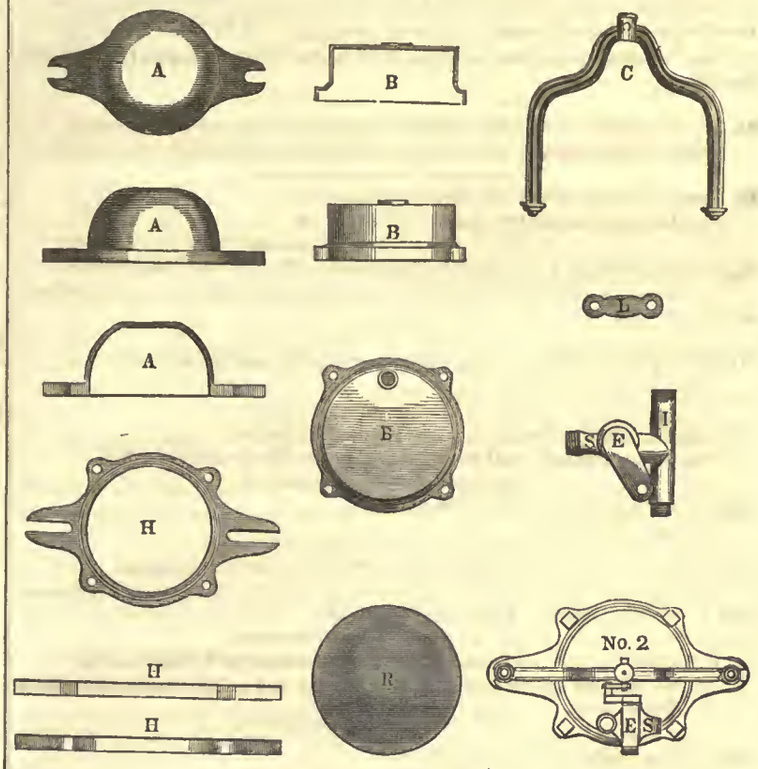
61. Chichester, J. B., *New York.*—Inventor.
Patent fan-blower, and model of a hydraulic ram.

62. Cochran, James, *New York.*—Manufacturer.
A hydrant.



Cochran's Hydrant.

[The object of this apparatus is to economize water, now so profusely wasted in hydrants of the common construction. It is said not to be liable to freeze; it is self-acting by the force of the water in the supply-pipes, and when the handle is raised it serves as a forcing hydrant. The large figure shows the instrument in condition for service; the doors of its inclosing-case, R R, are thrown open; when the handle, V, is raised, the water flows from the discharge-pipe, I. The motion of the lever, V, raises by means of the cross-frame, C; the spherical plunger, A, which is seen in the small figures, correspondingly lettered. This plunger acts against an India-rubber disc (R, small figure) confined by the hat-rim, H; the water, entering by the supply-pipe, S, is governed by the cock, E, connected with the cross-frame, D, by the lever, L, so that the cock is moved by the lever-handle. This connection is more distinctly seen in the plan No. 2. The diaphragm, *R*, prevents the escape of the water downward, while, at the same time, the pressure of the head acting upon the diaphragm, causes it to descend, carrying with it the spherical plunger, and closing the cock as soon as the hand is removed from the lever-handle. The circular box, B, called the top-piece, receives the water as it retires from the discharge-pipe. The whole apparatus is made of cast-iron, and no accurately turned or ground surfaces are required in its construction; the cock, E, being, in fact, the only piece requiring any accurate fitting. The Chief Engineer and Superintendent of the Croton Aqueduct Department, in New York, affirm that the principle involved in its construction is novel, and that it has for three months worked to their entire satisfaction in the office of the Company in New York. There can be no doubt that the constantly increasing demand for the Croton water, and other similar causes in the larger sources, compels the necessity of some contrivance like this to insure that economy in the use of water without which no supply can long prove adequate.]



Sections of Cochran's Hydrant.

63. Oetchel, J. F., *Elkton, Maryland.*—Patentee and Manufacturer.
Two hydraulic rams.

[The hydraulic ram is a truly singular device; nor is it easy to conceive how Montgolfier, of Montpelier, could have contrived so peculiar a machine. In 1797 he patented it in France, and since that date numerous small changes have been introduced in its construction, by which its use has been widely extended, though the principles of all its forms remain unaltered. The ram is chiefly useful in raising small quantities of water to heights considerably above the source of supply. For supplying farm-houses and grounds, or for any other purposes requiring small but constant water-elevation from a stream flowing near by, and at a low level, it may be used with great advantage. As the hydraulic ram involves a series of shocks or concussions in the valves, which reäct against its tube or confining-walls, it is not well fitted for raising large quantities of water, as the violence of its blows must then subject it to frequent derangements.

The essential parts of a self-acting hydraulic ram are the *conducting-tube*, or body of the ram, which leads the water from its upper reservoir to the head of the ram, or the air-vessel, with which it communicates by a clack ascension-valve opening inwards. A stop, or pulse-valve, is arranged in an orifice of the head, so that after it is thrown open, the stream of water issuing with an increasing velocity, forms so strong a current that the valve is carried back and closes the orifice. The living force which the descending column of water has thus acquired makes it then act instantly against the clack-valve, which it opens, and a certain portion of water rushes into the air-vessel, until the living force of the column is exhausted in compressing the confined air, when the air acts backward, giving a returning motion to the water-column, which closes the clack-valve, and opens the pulse-valve. It also opens a valve arranged for admitting some external air, which at the next beat ascends to the air-chamber, and thus keeps up the supply in the chamber, so as to insure a continuous water discharge. An ascension-tube, opening under the water in the air-chamber, conducts it to the point of discharge, it being propelled by the compressed air. A series of beats or oscillations thus goes on, in which the living force acquired by the descending main column is expended in compressing the confined air, the resistance of which is proportional to the height of the discharging point. Hollow ball valves are sometimes used. The air-chamber may be dispensed with by combining two or more rams to maintain

a continuous discharge, when the living force directly lifts the elevated column. At Marly, in France, a continuous jet, 187 feet high, is thus operated.

The efficiency of this machine is measured by the ratio $\frac{q.\ H_1}{Q.\ H}$, in which H is the main fall, H_1 the height of elevation above the ram-head, S the quantity of water passing through the ram, and q the quantity raised. Eytelwein, in some experiments, found this ratio as high as 0.90; a greater useful effect than any other water-machine has been known to give. By reducing the height of fall, and the consequent number of beats, this ratio becomes very small (0.18); $\frac{q.\ H_1}{Q.\ H} = 1{,}42 - 0{,}28\sqrt{\frac{H_1}{H}}$ is an approximate formula for Eytelwein's results from 1123 experiments. Calling P and p the weights of water expended and raised in a given time, the following expression for the effect will be nearly correct in ordinary cases: $p\,H_1 = 1.20\ P\ (H - 0{,}2\sqrt{H.\ H_1})$. The greatest effect of a hydraulic ram attained in France is from 123 to 144.7 lbs. feet per second.]

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64. Douglass, W. & B., *Middletown, Connecticut.*—Proprietors and Manufacturers.
Patent double-action metallic pumps, hydraulic rams, garden engines, iron curbs, &c.

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65. Newman, Nelson, *Cincinnati, Ohio.*—Manufacturer.
Double-acting force and lift-pump.

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66. Clemens, Stillman A., *Springfield, Massachusetts.*—Inventor and Manufacturer.
A water-meter; improved machine for breaking and dressing flax; new ventilator for railway cars.

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67. Johnson, Richard R., *Covington, Kentucky.*—Inventor and Manufacturer.
Patent force and lift pump.

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68. Creamer, Wm. G., *New Haven, Connecticut.*—Manufacturer.
Two garden engines; small force-pumps placed inside of covered buckets.

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69. Tower, Ambrose, *New York.*—Manufacturer.
Submerged force pump.

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70. Richmond, E., *Washington Street, Boston, Massachusetts.*—Manufacturer.
New rotary forcing-pump; cotton coiler; a machine for laying cotton in factory-cans, in eccentric helices, at a great saving of space.

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71. Hitchcock, Daniel F., *Warren, Massachusetts.*—Inventor and Manufacturer.
Suction and force pumps of improved construction, and working model to illustrate the principle involved.

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72. St. John, James, *New York.*—Proprietor.
Double-acting lever jack-screws.

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73. Williston, George, & Co., *Brunswick, Maine.*—Manufacturers.
Lever-jacks, consisting of a rack and pinion worked with a lever and pall. Rail-road iron straightener or curver; a heavy beam with clamps at the ends to hold the iron, which may be sprung to any shape by a screw and stirrup.

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74. Kent, Joseph, *Baltimore, Maryland.*—Designer.
Model of apparatus for conveying water from springs and wells up hill.

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75. Hatch, John B., *Boston, Massachusetts.*—Agent.
Fire engine for factories, steamers, &c.

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76. Harten, John, *New York.*
Patent fluid-meter.

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77. Huss, Samuel, *Boston, Massachusetts.*—Manufacturer.
Two water-meters.

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78. Brown & Ellis, *New York.*—Manufacturers.
Hot water apparatus.

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79. Hanson, Thomas, *New York.*—Agent.
Hydraulic ram.

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80. Baker & Graver, *Honesdale, Pennsylvania.*—Proprietors.
Hydraulic pump.

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81. Williams, Ezra S., *Deep River, Connecticut.*—Manufacturer.
Rotary pumps of various descriptions; fire engine pump; a leathern packing around the shaft is the only packing used.

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82. Woodruff, Joseph, *Railway, New Jersey.*—Manufacturer.
Machine for raising water.

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83. Reed, Karon, ———.—Patentee and Manufacturer.
Pump.

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84. Farnam, Gilbert B., *New York.*—Manufacturer.
Double-action lifting and forcing pumps.

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85. Ballard, William, *New York.*—Manufacturer.
Jack-screws.

[A screw, furnished with a suitable head and a projecting foot-claw, traverses through a bevel-wheel, which derives its motion from another bevel-wheel placed on an axis projecting from the body of the jack, and furnished with a crank.]

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86. Ransom, Franklin, *Cincinnati, Ohio.*—Manufacturer.
Ransom's Improved Vacuum Pumps.

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87. Strever, Franklin H., *New York.*—Manufacturer.
Force-pump, operated by steam or hand-power.

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88. Pryor, Samuel, *New York.*—Manufacturer.
Improved valve hydrant, with self-acting lock-handle.

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89. Lyon, Eliphalet, *New York.*—Agent.
Dugeon's Patent Portable Hydraulic Press.

[Motion is communicated to a solid cylinder or *ram* by the pressure of water forced into the exterior cylinder by a small pump. The pressures are to each other as the squares of the diameters of the plunger and the ram; so that a man, exercising a pressure of 100 lbs. on a pump of one inch diameter, will produce a weight of 10,000 lbs. with a press having a ram ten inches in diameter.]

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90. Dodge, Levi P. & Wm. F., *Newburgh, New York.*—Manufacturers.
Suction and force pump, with horizontal action.

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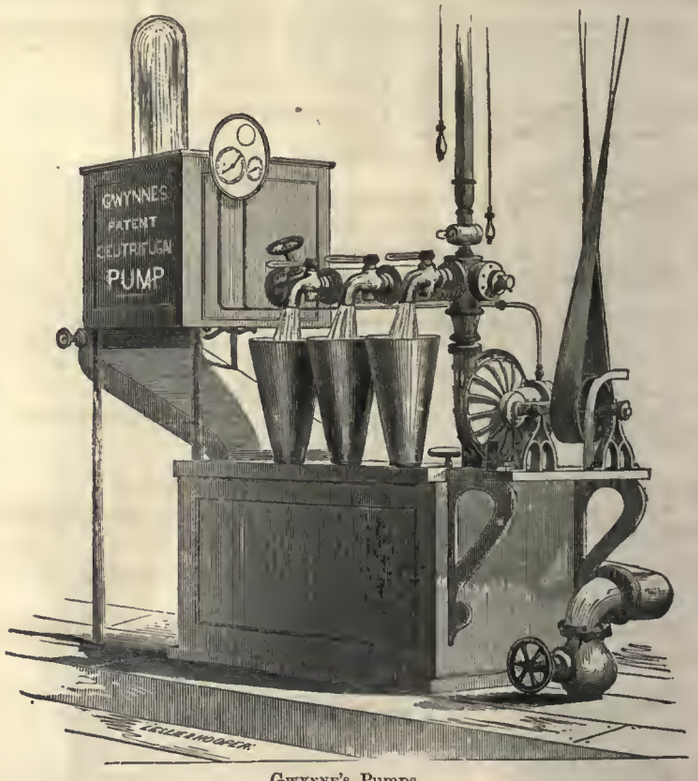
91. Union Power Company, *New York.*—Manufacturers and Proprietors.
Gwynne's Patent Reäction Centrifugal Pumps.
A drainage-pump; on exhibition as the Central Fountain. Its capacity is 6,000 gallons per minute, thrown 20 feet high.
A force and lift pump.



Gwynne's Pumps.

[Discharging water through four pipes at the rate of 500 gallons per minute; or forcing water through one pipe to the tanks on the top of the building, a height of 63 feet, at the rate of 300 gallons per minute; or as a fire-engine, throwing water through two pipes of one and one and a half inches diameter respectively, vertically 125 feet, or horizontally 200 feet, at the rate of 250 gallons per minute. The chief advantages claimed for this invention, which may be used where any species of pumps are employed, are economy of power, simplicity, and non-liability to derangement on account of the absence of valves and packings.]

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92. Fields, Wm., Jr., M. D., *Wilmington, Delaware.*—Patentee and Proprietor.
Improved hydraulic ram.

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93. Cook, Truman, *New York.*—Inventor.
Instrument illustrating the relative motions in a steam-engine.

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94. Lyman, A. S., *Novelty Works, New York.*—Inventor.
Improved steam-boiler water-gauge.

95. Perrin, Henry S., *New York.*—Agent.
Dunn's Patent Alarm Steam-boilers.

96. Sloan & Leggett, *Empire Iron Works, New York.*—Manufacturers.
Patent hydrostat, or apparatus for preventing explosion of steam-boilers.

97. Rice, James D., *Philadelphia, Pennsylvania.*—Inventor.
Register connected with boiler.

98. Clarke, S. J., *New York Gas Regulator Company, New York.*
Gas regulator.

99. Clark, Patrick, *Rahway, New Jersey.*—Inventor and Manufacturer.
A static fire regulator; has India-rubber diaphragm, lifted by the pressure of steam and regulating the damper.

100. Judd, Ilbert H., *Marvin Town, Illinois.*
Water-level safety-gauge and indicator.

[These are two floats, one of which works an index on a dial-plate on the front of the boiler, and the other admits steam to a whistle before the water has subsided to a dangerous level.]

101. Dickson, Peray, *Blooming Valley, Pennsylvania.*—Inventor.
Steam and water-gate regulator.

102. Lowe, Joshua, *New York.*—Proprietor.
Steam pressure-gauge, and steam pressure and vacuum gauge.

[A flexible metallic diaphragm sustains the pressure of steam, and moves a connecting index over a properly marked dial-plate.]

103. Collins, Jonathan & John J. G.
Patent self-acting protective safety-valve, by which the steam is allowed to escape when the water becomes low, and a whistle blown when the steam is at too high a pressure.

104. Jockley, Robert K., *Philadelphia, Pennsylvania.*—Inventor.
Steam alarm-whistle and water-indicator.

105. Leonard, W. A., *New York.*
Capstan and dynamometer.

106. McKinney, Arthur, *Tuthill, Ulster County, New York.*—Agent.
Adjustable gauge for setting the bows of carriage tops.

107. Morse, Stephen, *Springfield, Massachusetts.*—Patentee and Manufacturer.
Iron car-brake.

108. Alden, Charles, *New York.*—Manufacturer and Proprietor.
Circular ventilating window, applicable to railway carriages, steamboats, or dwellings.

109. Woolcocks & Ostaander, *New York.*—Inventors and Manufacturers.
Steam alarm-whistle indicator; a substitute for bells, used by acoustic connection with the cars.

110. Potter, Merrit F., *Charlmont, Massachusetts.*—Inventor and Proprietor.
Railway station indicator.

[Registers the distance passed over, and indicates to passengers the exact position of the car upon the track.]

111. Ames, Horatio, *Falls Village, Connecticut.*—Manufacturer.
Cranks, axles, and iron for locomotives.

112. Taylor, H. D., *Newark, New Jersey.*—Inventor.
Model of an arrangement to keep cars on the track.

113. Corning, E., & Co., *Albany, New York.*—Manufacturers.
Locomotive screw-jack.

[This is an ordinary screw-jack, driven by a lever and pall, and placed upon a base-frame, in which it may be made to travel horizontally by a second screw.]

114. Denney, S. L., *Christiana, Pennsylvania.*—Inventor.
Section of a railroad axle for curved track.

115. Baker, Samuel, *Portsmouth, New Hampshire.*—Inventor.
Model of a railway protector.

[Side-rails or walls, six or seven feet high, are built outside of the track, for the cars to fall against should they leave the rails.]

116. Woodward, H. M., *Brooklyn, New York.*—Designer.
Model in brass of a new railway truck.

117. Carpenter, H., *Rome, New York.*—Inventor.
Model of a railway switch and car.

118. Payne, Olcott & Co., *Corning, New York.*—Designers and Manufacturers.
Model of railway carriage.

119. Murray, Lindley, *New York.*—Inventor.
Model of railway car for curved track.

120. Ball, Leverett, *Auburn, New York.*—Patentee.
Patent car wheel; it is a plane disc with radial ribs and double flanges.

121. Brown, H. C., *Mount Morris, New York.*—Proprietor.
Model of railway chair.

122. Root, Albert, *New York.*—Agent.
Railroad car wheels.

123. Hart, C., *Bridgeport, Connecticut.*—Manufacturer.
Patent wheels for railway carriages, and veneer cutting-machine.

124. Durant, Edward J., *Lebanon, New Hampshire.*—Agent.
Model of railway car, with Livermore's Self-coupling and Truck Guide.

[Designed to prevent the lateral friction caused by the oscillation of the trucks on their king-bolts when running on straight tracks, and also preventing the grinding of the flanges of the wheels against the rails in passing curves.]

125. Thatcher, J. M., *Jersey City, New Jersey.*—Inventor.
Model of a stove for heating and ventilating railway cars.

126. Baldwin, D., *Godwinville, New Jersey.*
Railroad telegraph.

[The locomotive, in its passage by a station, closes and breaks the circuit of a battery by a spring passing over the stationary break pieces, the number of which designate the station.]

127. Wildman, Levi K., *Brookfield, Connecticut.*—Proprietor.
Iron railway switch.

128. Harris, R. N., *New York.*—Agent.
Railroad car break.

129. Swanton, William, *New York.*—Agent.
Spark arrester and deflector for locomotives, and model to illustrate its operation.

[It consists of a series of wire sieves and deflecting planes, designed to stop the sparks, and performing a similar office for the draught.]

130. Boley, John, *Van Buren Center, Onondaga County, New York.*
Model of self-adjusting lock railway switch, with miniature car.

131. Rice, D. E., *Detroit, Michigan.*—Patentee and Manufacturer.
Annunciator for railway carriages, to indicate the name of the station upon the arrival of the train.

132. Hall, Wm., *North Adams, Massachusetts.*—Patentee and Manufacturer.
Model of a platform railway car, with truck-frames and patent brake.

133. La Mothe, Bernard J., *New York.*—Proprietor.
Model of a railway carriage, made of steel bands, for preventing loss of life in railway traveling.

134. Abbott, J. G., *Manchester, New Hampshire.*—Manufacturer.
Cast-steel tires for car wheels and locomotive driving wheels.

135. Tuckerman, E. G., *New York.*—Manufacturer.
Model of railway car, with P. O'Neill's attachment for ventilating and excluding dust.

136. Arnett, W. D., *Fairfield, Iowa.*—Patentee and Proprietor.
Railroad car brake.

[Composed of a series of compound levers, by which the brakes at both ends of a car may be brought into action from either end.]

137. Kline, John F., *Trenton, New Jersey.*—Inventor and Manufacturer.
Model of a railroad switch and car.

138. Sherman, B. M., *New York.*
Safety railway car wheels and axles.

139. Sherburne, William, *New York.*—Manufacturer.
Lightner's Patent Railroad Axle Box.

[The chief feature in this box is in a packing plate above the brass, which may be taken out in relieving the box from the weight of the car, and give room to lift out the brass clear from the collars of the axle.]

140. Glendon Iron Works, *Boston, Massachusetts.*
Railway tuyere, axles, and specimens of iron.

141. Schuyler, J. F, *New York.*
Locomotive oil-can.

142. Lee, Edmund T., *Louisville, Kentucky.*—Inventor.
Working model of a pipe-railway.

143. Shattuck, W. F., *Waterford, New York.*
Eddy's patent railway-wheels, and a model of a fish-joint rail. These wheels are so formed, with a convex surface, that the unequal contraction in cooling of the metal is avoided.

144. Reeves, Buce & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Patent railway iron.

145. Fairbanks, E. and T., & Co., *St. Johnsbury, Vermont.*—Manufacturers.
Railroad depot scale; rolling-mill, platform, flour-packing, and counter scales, of various kinds.

146. Person & Brockett, *New York.*—Proprietors.
Numerating register for omnibuses, railway cars, &c. The fares are paid through little doors, respectively indicating the number of seats taken, up to four; the dial also indicates the aggregate per day or week.

147. Ross, Jonathan A., *St. Louis, Missouri.*—Manufacturer.
Dormant platform-scales.

148. New York Scale Makers' Company, *New York City.*
Platform and other scales.

149. Chalmers, *New York.*—Manufacturer.
Jackson's patent annunciator for hotels, &c.

[This is intended to supply the place of the present complicated system of bells for calling servants to the different rooms. It is ornamental, and occupies but a small space. Each signal on the dial-plate is distinct and separate, and remains exposed till the call is answered. It can be easily attached to the present arrangement of bells.]

150. Laidlaw, John, 339 *West 24th Street, New York.*—Inventor and Manufacturer.
Patent transparent gas-meter, for registry of the amount of gas consumed; double detector gas-holder; patent experimental gas-meter, to show the rate of consumption per hour of different burners; governors, pressure indicators, and gauges.
Manufactured by American Gas Meter Company at Waterbury, Connecticut.

151. Down, Samuel, *West 22d Street, New York.*—Manufacturer.
Improved dry gas-meter. The same as is used for measuring the gas consumed in the New York Crystal Palace.

152. Thorne & Co., *Green Point, Kings County, New York.*—Manufacturers.
Light carriage, of superior strength, convenience, and economy.

153. Hubbard, M. G., *Rochester, New York.*—Manufacturer.
Covered buggy, hung on peculiar springs.

154. Stephenson, John, *New York.*—Manufacturer.
Omnibus for twelve. The whiffle-trees are independent of each other, and curved back in the middle so that the horses may travel freely with short traces. The wheels are furnished with a brake, applied by the foot of the driver.

155. Miner & Stevens, *New York.*—Manufacturers.
Barouche, phaeton, and light wagon.

156. Smith, John, & Sons, *Brooklyn, New York.*—Manufacturers.
Light, open pleasure-wagon. The body is swung high, and sprung up for the front wheels, which are large, and furnished with round-edged tires, to pass under when the wagon is being turned.

157. King & Wilcoxson, *New York.*—Manufacturers.
Four-seat rockaway carriage.

158. Lawrence & Bradley, *New Haven, Connecticut.*—Manufacturers.
Pleasure-carriage, of elaborate finish, lined with mazarine blue velvet.

159. Briggs, John, *Boston, Massachusetts.*—Patentee.
Changeable seat for railway carriages.

160. Beardsley, Charles, *New York.*—Manufacturer.
A light carriage, with two seats.

161. Ham, John C., *New York.*—Manufacturer.
A light wagon, and a large, handsomely furnished carriage, lined with figured silk.

162. Dusenbury & Arthur, *New York.*—Manufacturers.
Light trotting-wagon.

163. City Hose Company, No. 8, *New York.*—Proprietors.
Hose-carriage.

161. Robinson, Thomas L., *Boston, Massachusetts.*—Manufacturer.
Elaborately finished sleigh.

165. Watson, George W., *Philadelphia, Pennsylvania.*—Manufacturer.
"Gazelle" wagon. See page 000 "Illustrated Record."

166. Lewis, E. E., *Canandaigua, New York.*—Patentee and Manufacturer.
An open buggy, fitted with Hubbard's patent carriage-gearing.

167. Smith, J. L., *New York.*—Manufacturer.
Improved buggy, with folding top and bracket front.

168. Edson, J. N., *New Orleans, Louisiana.*
Buggy hung on spiral springs.

169. Scriptuer, E. S., *Green Point, New York.*—Manufacturer.
Patent-top buggy.

170. Miller, Henry, *Detroit, Michigan.*—Proprietor.
Tobacco-chariot.

171. McKinstry, Jr., R., *New York.*—Manufacturer.
Buggy, without top.

172. Hope Hose Company, *Philadelphia, Pennsylvania.*—Proprietors.
Hose-carriage, of elaborate finish.

173. Neptune Hose Company, *Philadelphia, Pennsylvania.*—Proprietors.
Hose-carriage, richly ornamented.

174. Wood, Tomlinson & Co., *New York.*—Manufacturers.
Four-wheeled dog-cart.

175. Haussknecht, Johnson & Co., *New Haven, Connecticut.*—Manufacturers.
Large carriage, hung on a multitude of springs, and furnished with Haussknecht's patent short-turning gear.

GREAT BRITAIN AND IRELAND.

176. Dunn, Joseph, *Rainton Colliery, England.*—Inventor.
Model of a railway turn-table, for reversing locomotives. The rails of the platform are supported throughout their entire length by inclined planes or wedges, which are brought into action when required, and render the table perfectly rigid while a train is passing over.

177. Stevens, James, *Darlington Works, Southwark, England.*—Inventor.
Railway signals.

178. Hutton, John, & Sons, *Summerhill, Dublin.*—Manufacturers.
New brougham; new Irish jaunting-car; colored drawing of a dress-coach building for Her Majesty the Queen of Great Britain.

BRITISH COLONIES—CANADA.

179. Gingrass, E., *Quebec.*—Manufacturer.
A double phaeton, with hood, pole, and shafts.

180. Saurin, J. L., *Quebec.*—Manufacturer.
Carriages and sleighs. The carriages are low and easy of access, and are hung on small wheels. The sleighs are lined with a dark-colored morocco.

FRANCE.

181. Moussard, Alexis, *Montmartre, Paris.*—Manufacturer.
A heavy state-carriage for gala days.

THE NETHERLANDS.

182. Soeders, G., *Maarssen, near Utrecht.*—Manufacturer.
Model of a new movable or double-acting safety carriage-axle, a railway level, and a seal-press.

183. Diessenbrock & Reigers, *Ulft, near Ferborgh.*—Inventors and Manufacturers.
Fire-engine, of a new construction.

184. Lehman, J. S., *Rotterdam.*—Manufacturer.
Phaeton carriage.

SWEDEN AND NORWAY.

185. Thesen, J. P., *Christiana, Norway.*—Proprietor.
Norwegian traveling carriage, called "Kariol."

SECTION II. CLASS VI.

MANUFACTURING MACHINES AND TOOLS.

THE machines and tools included under the Sixth Class are employed in manufacturing the raw materials enumerated in the First Division of the Catalogue. They perform those operations which were once executed only by the direct labor of man; and they perform them with a certainty and precision rarely, if ever, attained by human labor. The cotton yarn, for example, spun by the skillful hands of the Hindoo, though rivaling the fineness of English machine-spun yarn, is much less even and regular. They have also the advantage of extending their productive power indefinitely by increasing the number of their individual parts. The advantages which have resulted from the employment of manufacturing machines have been so often and so clearly stated elsewhere, that it is unnecessary to enumerate them here. The substitution of machine for hand labor is constantly and rapidly going on in every branch of industry; machines already in use are annually becoming more nearly automatic by the improvements made in their construction; and as often as the necessities of commerce demand it, new mechanical combinations are invented to bring new varieties of labor within the control of the steam-engine and its arms of steel.

The Class embraces the following sections:—Machines employed in the manufacture of spun, woven, and laid fabrics; in the manufacture of metals; in that of mineral substances; in that of vegetable substances; in brewing, distilling, and in the manufactures of chemistry.

The manufacture of cotton and similar fabrics is but sparingly illustrated in the present Exhibition. Those machines that are shown, however, are worthy of a careful study; many of them were in operation. A very interesting display was made of sewing machines, no less than 12 exhibitors presenting these novel and most important labor-saving inventions. In the manufacture of wood, several machines, of greater or less novelty, were shown in operation. These machines are peculiar to our country and highly honorable to its mechanical invention.

All the machinery in the Exhibition was arranged in a long arcade, built expressly for its reception, and furnished through its whole length with shafting, driven by the engines noticed in the preceding class.

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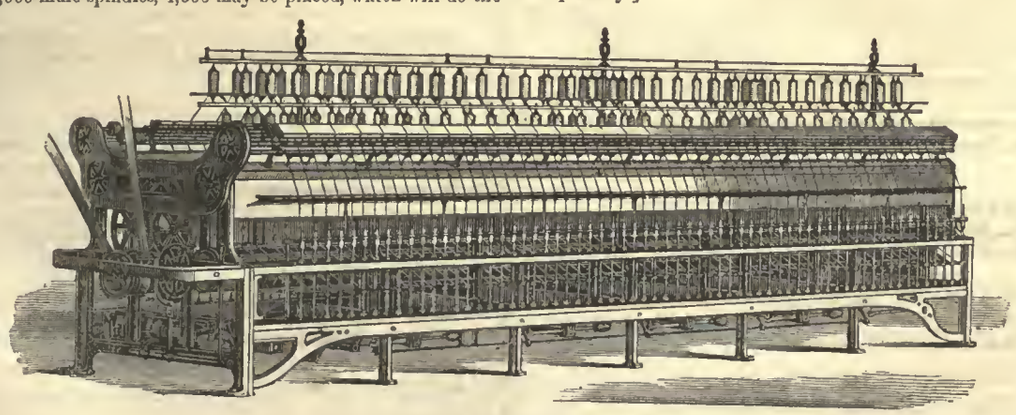
1. DODGE, JOHN C., *Dodgeville, Attleborough, Massachusetts.*—Proprietor.
Spinning frame, known as the Dodge Cop Spinner.

[This is a combination of the self-acting mule and throstle, having advantages over the common method of spinning, and applicable to filling and warp yarn. In the room usually occupied for 1,000 mule spindles, 1,500 may be placed, which will do the work of 3,000 spindles. It occupies the usual space required for warp spinning, but will spin 50 per cent. more yarn to the spindle than the best ring bobbin spinning known to be in use, and with a saving of two-fifths of the power. It will spin 100 per cent. more yarn than the flyer spindle, and with one-half the power compared to the quantity.]



DODGE'S Cop Spinner.

2. KING, OBED, *Salem, Ohio.*—Manufacturer.
Hand loom.

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3. BENJAMIN, WM., & Co., *Stockport, Columbia Co., New York.*—Manufacturers.
Reynold's Patent Power Loom, in practical working order.

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4. BATES, HYDE & Co., *Bridgewater, Massachusetts.*—Manufacturers and Proprietors.
Saw cotton-gin. Figured in Illustrated Record, p. 8.

5. PRATT, NATHANIEL M., & SONS, *Gloucester City, New Jersey.*—Manufacturers and Proprietors.
Power-loom harnesses of varnished silk, used in weaving cloth.

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6. LIGHTBODY, JAMES, *Jersey City, New Jersey.*—Proprietor.
Machine for all kinds of figure-weaving.

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7. GARRETSON, JOHN A., *Salem, Iowa.*—Inventor.
A hand-loom—simple in its construction.

8. Whitney, Eli, *New Haven, Connecticut.*—Proprietor.
Small model of the cotton-gin invented by the father of the exhibitor, and patented in 1793. [See p. 8, Illustrated Record.]

9. Tainter, Daniel, *Worcester, Massachusetts.*—Proprietor and Manufacturer.
Wool-carding machine.

10. Calvert & Sargent, *Lowell, Massachusetts.*—Manufacturers and Proprietors.
Cotton-gin, with burred iron cylinders as a substitute for the saw; exhibited as an improvement in the mode of separating the staple from the seed.

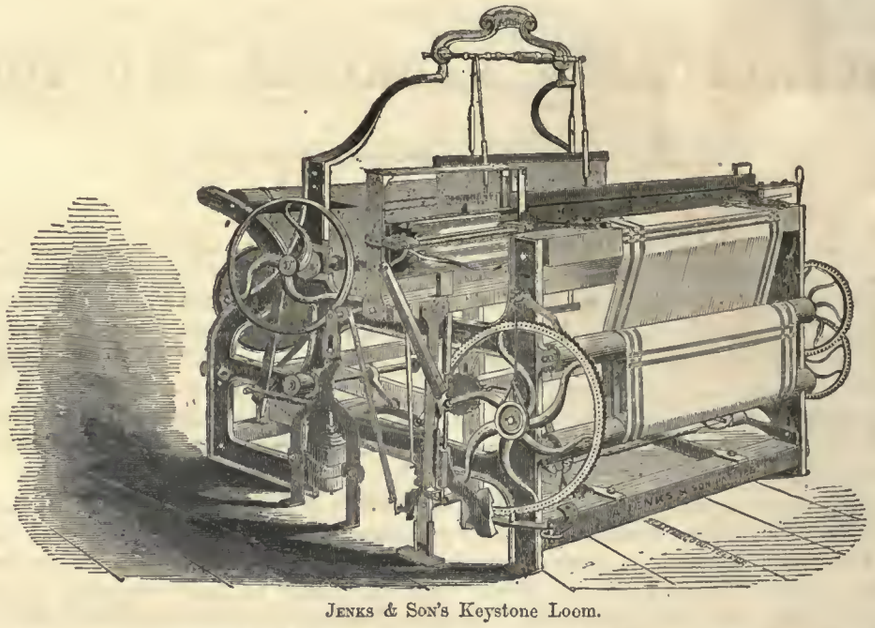
11. Carver, E., & Co., *East Bridgewater, Massachusetts.*—Manufacturers.
Saw cotton-gin.

12. Collins, Charles, *Hartford, Connecticut.*—Proprietor.
Wylly's Patent Drawing Regulator, for equalizing the sliver in drawing cotton, &c.
Wylly's Automatic Power-machine, for manufacturing roller cots.

13. Stokes, William, *Manayunk, Pennsylvania.*—Inventor and Manufacturer.
Stocking-net machine.

14. Jenks, Alfred, & Son, *Bridesburg, Pennsylvania.*—Manufacturers.
Looms for cassimeres and ginghams.

[By using a different shuttle from the ordinary one, silk goods may be woven on this loom with as much facility as cotton or wool; and a Jacquard motion, if desired, may be easily attached. It is 40 inches wide, and has four shuttle drop-boxes at one end of the lay, and an improved pattern wheel for controlling the boxes, which will run 1,200 picks before it ends, and can be extended to a greater capacity.]



Jenks & Son's Keystone Loom.

15. Slaughter, F. & J. W., *Fredericksburgh, Virginia.*—Inventors and Manufacturers.
Rope and cordage machine, with samples of the manufactures.

16. Kellogg, E., & Co., *Pine Meadow, Connecticut.*—Proprietors and Manufacturers.
Machine for carding various substances; wool and cotton picker.

17. Kitson, Richard, *Lowell, Massachusetts.*—Inventor.
Needle-pointed card clothing, for flax, hemp, &c.

18. Gowdy, J. A., & Son, *Providence, Rhode Island.*—Manufacturers.
Weavers' reeds.

19. Taylor, E. T., & Co., *Columbus, Georgia.*—Manufacturers.
Working model of an improved saw cotton-gin.

20. William, N. L., *Cincinnati, Ohio.*—Proprietor.
Flax-breaking and dressing machine.

21. Carver, Washburn & Co., *Bridgewater, Massachusetts.*—Manufacturers.
Cotton-gin.

22. Godwin, J. D., *Fitchburg, Massachusetts.*—Manufacturer.
Weavers' reeds.

23. Chichester, L. S., *Brooklyn, New York.*—Patentee and Manufacturer.
Machine for dressing flax, hemp, &c.; represented to be capable of dressing one ton of straw per day with three horse power.
Flax-breaking machine.
[These machines are figured and described in the Illustrated Record, page 135.]

24. Baldwin, Joseph, *Nashua, New Hampshire.*—Manufacturer.
Bobbins and shuttles.

25. Brandreb, B., & Son, *Oldham, New Jersey.*—Manufacturers.
Cotton spinning frame.

26. Hays, Hezekiah, *Orange, New Jersey.*
Lace cutter.

27. Howe, Jr., Elias, *Cambridgeport, Massachusetts*, and *New York City.*—Patentee.
Sewing machine.

[An accurate idea of the seam formed by this machine, the first practical one invented, may be gained by twisting two threads together, and imagining them so disposed that they cross in the cloth, with the loops on either side forming the stitches.]

28. Wheeler, Wilson & Co., *Watertown, Connecticut.*—Proprietors and Manufacturers.
A seaming-lathe, for stitching linen, cotton, and other fabrics; has one needle, and forms a lock-stitch with a revolving hook. The feed motion, by which the length of the stitch is regulated, is gained by a double cam.

29. Barthole, Abraham, *New York.*—Proprietor and Manufacturer.
Improved sewing machine.

30. Crosby, Pearson, *Fredonia, New York.*—Patentee and Manufacturer.
Improved self-feeding sewing machine.

31. Batchelder, J., & Co., *Lisbon Cotton Mills, Lisbon, Connecticut.*—Manufacturers.
Sewing machine.

32. Grover, Baker & Co., *Haymarket Square, Boston, Massachusetts.*—Inventors and Manufacturers.
Sewing machine, working with a straight vertical needle, and a curved needle, forming, as it were, a four-threaded stitch—one thread on one side of the cloth, and three on the under. The machine both sews and stitches, and works on either coarse or fine fabrics.

33. Wickersham, William, *Boston, Massachusetts.*—Inventor and Patentee.
Boot and leather sewing machine. Works with a hook and needle; and, with a single thread, makes a loop-stitch.

34. Ambler, Daniel C., *New York.*—Inventor and Manufacturer.
Working model of a balance-beam saw-mill, of new design.
Sewing machine.

35. Ross, Jonathan A., *St. Louis, Missouri.*—Inventor.
Sewing machine—is a shuttle-machine, combined with a slot motion, which enables it to sew button-holes.

36. Palmer, Freeman, *Conneaut, Ohio.*—Inventor and Proprietor.
Sewing machine.

37. Avery Sewing Machine Company, *New York.*—Proprietors and Manufacturers.
Three sewing machines, respectively adapted to sewing woolen goods, muslin and linen fabrics, and leather.

[These machines have two needles, one below and the other above the cloth to be sewed. The eyes of the needles are near the points, and as the one needle passes through the cloth and then withdraws a short distance, the other needle passes through the loop thus formed, and proceeds with a similar operation, which is alternately repeated by the needles, and results in a series of "half-hitches," with the threads on

each other. The cloth is carried forward by a reciprocating motion, which may be regulated to any length of stitch desired.]

38. Singer, J. M., & Co., *New York.*—Proprietors and Manufacturers.
Patent, straight needle, vertical sewing machine.

[The needle passes through the cloth and beyond a shuttle, which enters between the needle and thread; and, when both are withdrawn, forms a stitch with their respective threads in the cloth. The cloth is shifted for the stitches by a wheel.]

Singer's Sewing Machine.

39. Nicolay, John G., *Pittsfield, Pike Co., Illinois.*—Inventor.
New rotary power printing-press, differing essentially from any now in use.

40. Griffin, Hermon, *New York.*—Manufacturer.
Town's patent machine for paging the sheets of blank-books.

41. Clayton, E. B., & Sons, *New York.*—Agents.
Copying and notarial presses.

42. Marsh & Welch, *New York.*—Proprietors and Manufacturers.
Patent cylinder, steam printing-press.

43. Hickock, W. O., *Harrisburg, Pennsylvania.*—Patentee and Manufacturer.
Ruling machine.

44. Bruff, James B., *New York.*—Inventor.
Model of a press for stamping bills of lading, notes, drafts, &c.

45. Parks, John A., *New York.*—Manufacturer.
Lithographic press.

[In nearly all printing from stone, the surface from which impressions are taken may be regarded as essentially flat, the amount of relief or depression being too small greatly to influence the printing. This, with the brittle character of the stone used, makes it impracticable to produce the printing pressure by a cylinder, as is done in the copper plate and typographical presses. Instead of this, a blunt knife-edge scraper is uniformly employed, and is so arranged as to slide over a protecting covering or tympan, through which it acts on the paper and printing surface, giving them in progression a sharp pressure on the narrow line, under the scraper. This necessary feature stamps a peculiar character on the lithographic press, which, even as it is now used, has a decided appearance of clumsiness. It is surely not due to lack of efforts that lithographic presses are still confessedly unsatisfactory, since a very great variety of modifications and rearrangements have been made; though, amid many partial successes, it is apparent that much inelegant and rude contrivance has been fruitlessly expended on this machine. Lithographers are not machinists, nor are machinists lithographers; hence the requisite elements for success rarely conspire in favor of lithographic presses.

The hand-press in most common use consists of a frame, supporting rollers on which the bed-plate of the stone traverses, so as to pass under the scraper, which is supported in guides, underneath a strong cast-iron arch, by a regulating screw. The tympan is a large sheet of leather, stretched on an iron frame, connected by a hinge to the bed-plate. This is folded back against the scraper arch between printings, and is turned down over the stone during the printing. A crank and cog-wheels are arranged to drag the bed and tympan under the scraper, and a lever is provided for throwing on, and for relieving the pressure, which is received on an iron roller under the scraper. On throwing off the pressure after printing, the bed traverses back to the position for wetting and inking the drawing. Thus it will be seen that a lithographic press, as a whole, is but an arrangement for passing the printing surface under a scraper, so as powerfully to press the paper against it, while both paper and drawing are protected.

The application of steam power to lithographic presses, and for wetting and inking the stones, has to some extent been made, though the degree of success reached is still a matter of some discussion. More rapid printing is thus accomplished, but the style of work is sacrificed to a serious extent. Whether, on the whole, economy favors the side of steam power, depends entirely on the amount and quality of work required. For large quantities of indifferent work it is of undoubted economy, but for fine crayon printing, &c., nothing but the hand-press can yet be used with propriety or profit. For small establishments, and in times of slack work, steam lithographic printing is not only injurious to style, but is positively uneconomical *pro rata.* It is likely to grow more into use by improved machinery; but, even with all probable meliorations, it can hardly result in the exaltation of lithographic art.]

46. Bradford, Joseph, *Portland, Maine.*
Bookbinders' press and planes.

47. Wilkinson, Jordan & Co., *New York.*—Inventors and Manufacturers.
Wilkinson's cylindrical, rotary printing-press.

48. Jackman, Storrs E., *New York.*
Paper-cutting machines, for bookbinders.

49. Mahan, Jason M., *Philadelphia, Pennsylvania.*—Inventor and Manufacturer.
Patent stereotyping apparatus; machine for finishing the plates.

50. Taylor, A. B., & Sons, *New York.*
Patent steam cylinder printing machine.

51. Adams, J. & S., & Co., *Boston, Massachusetts.*
Patent printing-press, and standing-press.

[These machines were employed by John F. Trow, in printing the World of Art and Industry, or Illustrated Record of the Crystal Palace, published by G. P. Putnam & Co. The machines were placed in the east nave of the Palace; they are figured and described in the Illustrated Record, page 60.]

52. Snow, George K., *Boston, Massachusetts.*—Inventor and Patentee.
Machine for folding newspapers, and for bookbinders' use.

53. Maxwell, G. S., *New York.*—Proprietor and Manufacturer.
Lithographic press.

54. Hussey, John, *New York.*—Manufacturer.
Lithographic roller.

55. Starr, Charles, *New York City.*—Inventor and Proprietor.
Machines for backing and finishing books.

[The stitched sheets forming the book are fixed in clamps, which oscillate under a heavily-weighted roller, and the motion and weight occasion the required rounding of the back. The roller may be engraved with any design, and, heated by steam passed through its axle, will transmit its pattern embossed upon the book.]

56. Eisenbrandt, C. H., *Baltimore, Maryland.*—Manufacturer.
Printing machine for the blind.

57. Johnson, L., & Co., *Philadelphia, Pennsylvania.*—Manufacturer.
Machine for casting stereotype and electrotype plates.
Type-casting machine.
[This machine is figured and described in the Illustrated Record, page 43.]

58. Hanson, Moses P., *Boston, Massachusetts.*—Proprietor.
Machine for paper-makers and bookbinders.

59. Gaskill, Copper & Fay, *Philadelphia, Pennsylvania.*—Manufacturer.
Side dies, stamps, and rolls, for the use of bookbinders.

60. Pfister, Guido, *New York.*—Manufacturer.
Three rolls for lithographers.

61. Foster, C., & Brothers, *Cincinnati, Ohio.*—Manufacturers.
Hand-printing press.

62. Laing, Joseph, & Co., *New York.*
Lithographic press-work.

63. Law, Henry, *New York.*—Manufacturer.
Toggle-joint standing-press, with double sets of gearing working the screw, bringing the toggles together. The platen has guide-rollers running on the columns of the press.

64. McAdams, John & William, *Boston.*—Inventors and Manufacturers.
Improved ruling machine. Machine for paging blank-books.

[These machines afford useful protection to the merchant and tradesman, by the consecutive paging of account and other manuscript books.]

65. Russell, John, *Sing Sing, New York.*
American files.

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66. Collett, Oscar, *St. Louis, Missouri.*—Manufacturer and Proprietor.
Machine to bend tin-plate and sheet-iron.

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67. Felt, John G., *Salem, Mass.*—Manufacturer.
Machine for cutting wheels for clocks and watches.

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68. Rogers, Calvin B., *Deep River, Connecticut.*—Inventor and Manufacturer.
Machine for filing circular saws.

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69. Westerly, J. M., *Astoria, L. I., New York.*—Manufacturer.
Ornamental punches, cut in steel, for type-founders' use.

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70. Wyckoff, A., *Cincinnati, Ohio.*—Inventor and Manufacturer.
Machine for making jack-chain links.

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71. Browning, William A., *Matteawan, Dutchess Co., New York.*—Proprietor.
Machine for cutting the teeth of wool and other cards.

[A card, in cotton or woolen machinery, is a fine wire brush on a leather stock, used to arrange the fibers of cotton or wool in symmetrical order. The fineness of the yarn and the beauty of the cloth depends, to a large extent, on the carding operation, and it is obviously of great importance that the teeth should be of uniform length and angle.]

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72. Griffiths, S. & J., *Philadelphia, Pennsylvania.*—Manufacturers.
Patent screw-cutting die.

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73. Fretschler, W. O. C., *Brooklyn, New York.*—Inventor.
Model of a rock drill.

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74. Fitch, George S., & Co., *New York.*—Agents.
Brunswick grindstone.

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75. Inslee, A., & Co., *Newark, New Jersey.*—Manufacturers and Proprietors.
Vertical, back-geared power drill.

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76. Flagler, Frederick P., *New York.*—Manufacturer.
Portable forges and bellows for blacksmiths, jewelers and dentists.

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77. Leonard, W. A., *New York.*
Iron-planer and engine lathe.

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78. Isbester, Caleb, *Alleghany City, Pennsylvania.*
Rotary nail-plate feeder. The plate from which the nails are cut is reversed at every operation, so that the nails are cut alternately with head and point from either side.

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79. Smith, E. H., *New York.*—Agent.
Model of a machine for cutting brads and shoe nails.

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80. Holmes, J. B., *Cincinnati, Ohio.*—Inventor and Manufacturer.
Power nail-driving machine, used in making wash-boards.

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81. Porter, Jr., Norman, *Berlin, Connecticut.*—Proprietor.
Improved patent bench vice, with Bliss' attachment for holding taper work, consisting of a separate triangular piece of metal readily detached from the vice by a set screw, and moving on a pivot to adapt itself to any angular piece of work which may be placed in the vice.

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82. Daggett, William, *Worcester, Massachusetts.*—Inventor.
Self-feeding patent hand drill.

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83. Vine, William, *Hartford, Connecticut.*—Patentee and Manufacturer.
Gold-leaf beating machine. The package of gold leaf is shifted under an ordinary trip hammer, by a series of cams, securing the uniformity of action desired.

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84. Bottom, James M., *Bridgeport, Connecticut.*—Patentee.
Improved patent lathe and lathe-chucks for turning and finishing watch pivots, staffs, &c.

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85. Rust, Samuel, *New York.*—Manufacturer and Proprietor.
Improved power punching and shearing presses. (Patent applied for.)

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86. Whipple, Solomon, *Albany, New York.*—Inventor and Proprietor.
Model of file-cutting machine.

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87. Leonard, P. A., *New York.*—Agent.
A continuous feed drill.

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88. Peacock, James, *Paterson, New Jersey.*—Proprietor.
Two sets of stocks and dies for screws and taps of various dimensions.

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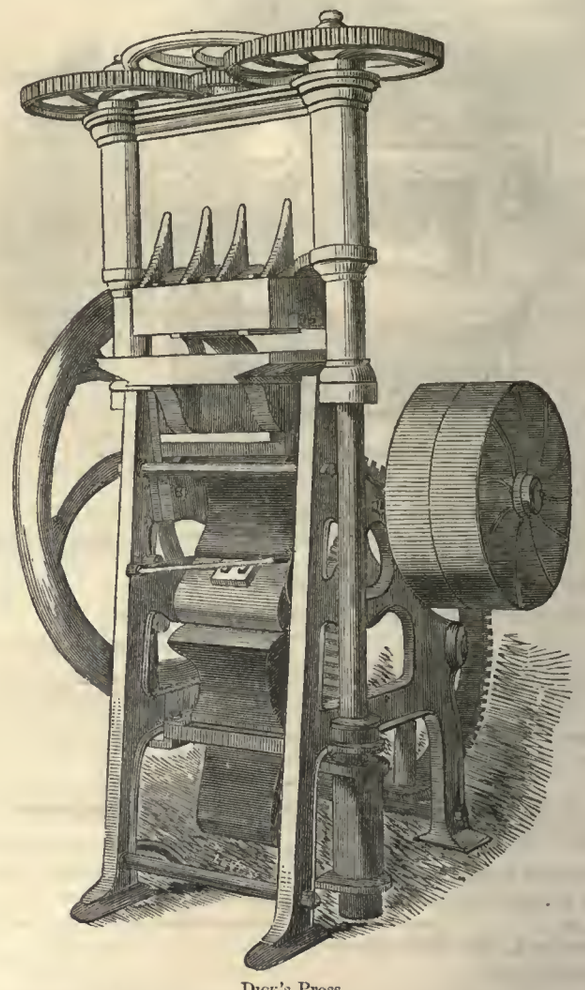
89. Dick, David, *Meadville, Pennsylvania.*—Patentee and Proprietor.
Boiler-plate shears of great power.

[The upper jaw of the frame, which is a massive casting, holds a shearing knife with an inclined edge, against which the plate under operation is lifted by the action of the cams. These are two in number, case-hardened and attached to an iron shaft turned by a lever worked by a double crank, on which the lever travels, and raising and falling with the revolutions of the crank. Iron plates with curved faces, peculiarly adapted to the curve of the cams, are fitted on fulcrum pins above and below the cams, the lower ones being stationary, and the upper moving the frame which lifts the plate to the shear as the cams are turned. The motion of the crank shaft is by cog gearing, furnished with levers and clutches for throwing in and out of gear.]



Dick's Press.

Embossing press for bookbinders.

[It has upper and lower stocks of cast iron, connected by wrought iron standards. The single cam used in this press, turns on a shaft by a lever connected with it between two plates, which move on fulcrum pins, the lower being stationary and the upper raising the press plate by the thrust of the cam.

The application of a similar cam is illustrated by a boiler-plate punch, hand punch, power punch, saw gummer, and tobacco press.

The first practical application of this arrangement of cams was made by Charles B. Stuart, C. E., in drawing out the coffer-dam piles of the United States Dry Dock at the Brooklyn Navy Yard. These piles were sixteen inches square, and driven close together, with square grooves into which tongues were driven to make tight joints. Their lengths varied from forty to sixty feet, the tops being flush with the embankment of the coffer dam. After several trials, in which chain cables, steel pins, &c., were broken, an arrangement with steel links and pin secured to the pile was made sufficiently strong to sustain the pressure of the cam, and the first pile was drawn under circumstances of no ordinary difficulty, the force used being calculated at not less than 637 tons. In one of the trials a portion of the section of a yellow pine pile was torn out by the lifting force on a pin three inches in diameter, driven through the pile six feet below the top, the grain of the wood being separated the whole width of the pin.]

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90. Sands & Cummings, *Washington City, D. C.*—Inventors and Proprietors.
Model of a brick machine.

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91. Sampson, A. H., *New Orleans, Louisiana.*
Model of a patent brick machine.

92. Waoner & Imlay, *Philadelphia, Pennsylvania.*—Inventors and Proprietors.
Model in brass of a patent brick press, for making bricks from crude clay.

93. Smith, F. H., *Baltimore, Maryland.*—Inventor.
Brick machine and six bricks.

94. Norton & Gardiner, *New York.*—Manufacturers.
Patent gold-washing machine, amalgamator and magnetic seperator, adapted to quartz rock, and to all the earths and sands in which gold is found.

95. Cutler, Thomas, *Jersey City, New Jersey.*—Inventor and Manufacturer.
Centrifugal mill for crushing quartz.

96. Knight, Henry G., *Boston, Massachusetts.*—Patentee.
Model of horizontal and vertical steam drills.

97. Karelsen, E., *New York.*—Manufacturer.
Machine for cutting glass shades, glaziers' diamonds, and points for lithographing.

98. Adams, N., *Cornwall, New York.*—Inventor and Manufacturer.
Model of a machine for moulding and pressing bricks.

99. Greely, Joseph, *Nashville, New Hampshire.*—Manufacturer.
Eastman's patent stone-dressing machine, for plain and ornamental work. The cutters in this machine have a vibratory motion by which the stone is dressed similarly to the operation of hand.

100. Bussino, Robert S., *Novelty Iron Works, New York.*—Patentee and Proprietor.
Buffum's Centripetal Amalgamator; a machine for separating gold from pulverized quartz by vortex or whirlpool action.

101. Cochran, John W., *New York.*—Inventor.
Model of a crushing machine.
Model of a quartz-crushing machine. A series of spheres are revolved in a circular trough, from the center of which the material to be crushed is entered.
Model of a stone-dressing machine. The stone to be dressed is placed on a bed-plate, similar to that of a planing machine, and passes under a series of circular cutters, placed on a rotary traversing frame.
Sawing machine; which will cut ship timber to any curve or angle.

102. Whitney, D., *New York.*—Agent.
Patent brick mills.

103. Ogden, A. H., *New York.*—Manufacturer.
Steam-engine of glass; in working order; designed for fancy glass-blowing.

104. Hinckley, Zenos R., (Agent for Manomet Company,) *Sandwich, Massachusetts.*
Model of quartz-crushing machine.
Machine for manufacturing nails.

105. Smith, Isaac, *New York.*—Agent.
Brick machine for making bricks from dry clay.
Self-clearing anchor.
[There are broad extension pieces connecting the palms and giving a much greater bearing surface than is obtained with the ordinary anchor. The stock is braced by diagonal stays, riveted over at each end and bolted to the shank. A long clavis is bolted to the throat of the anchor, and serves to clear it when entangled with the bottom, and is also useful when it is being fished.]

106. Shands, Joseph G., *St. Louis, Missouri.*
Mill-stone dressing machine. The vertical cutters in this machine are worked by a cam and spring, and traverse in a frame swung from the center of the stone.

107. Smith & Knowles, *New York.*
Patent saw-mill. The peculiar characteristic consists in expanding the face of the teeth of the saw.

108. Peteler, Alois, *New York.*
Machine for freezing ice-cream; in which a motion is given to the interior contrary to that of the can, and the surface of the can is provided with helical planes, which give a second motion to the freezing mixture.

109. Trapp, William, *Elmira, New York.*—Manufacturer.
Keg and barrel-making machines.
[These are a series of machines and tools adapted for the various operations in stave and head cutting, jointing, and planing. They are—
A cylindrical saw to cut the staves hollow.
A double circular saw to cut the staves to the required length.
An apparatus for planing the staves inside and outside.
A circular plane for jointing.
A holder for turning the croze and chanfrin.
A head lathe, with sundry hand tools.
The machinery works dry wood, and the barrels are tight and perfect.]

110. Hartson, G. B., *Globe Grove Works, New York.*—Manufacturer.
Centrifugal sugar-cleaning mill. The sugar is inclosed in cylindrical strainers, to which is imparted a rapid rotary motion, throwing off the moisture and rapidly draining the sugar.

111. Buck, M. & J. H., *Lebanon, New Hampshire.*—Proprietors and Manufacturers.
Machine for planing, tenoning, boring, and mortising timber.

112. Titus, Theodore, *Matteawan, Dutchess County, New York.*—Manufacturer.
Planing and mortising machine.

113. Seaman, C. E., *Philadelphia, Pennsylvania.*—Inventor.
Ice-cream freezer.

114. Hutchinson, C. B., & Co., *Syracuse, New York.*—Inventor.
Machine for making staves and barrels.
[The staves are cut from bolts previously steamed, and presented to a knife placed on a cylinder, provided with adjustable gauges, by which the thickness of the staves is regulated. In the jointer the stave is carried endwise on a curve, between circular saws, inclined so as to give the correct level, and jointing both edges at once, while the bilge or swell is determined by the radius of the circle on which the stave moves. The saws are hung in swinging frames, by which the angles are so varied that barrels of uniform shape are obtained from wide or narrow staves. There are also head-turners, and cutters, and crozers.]

115. Vananden, H. A., *New York.*—Manufacturer.
Prismatic turning lathe. The wood is chucked between a pivot and a face-plate, divided into circular segments and fed by hand, under a series of rotary cutters, which finish one side of the prism. The wood is then shifted and the operation repeated for another side.

116. Selton, John, *Columbus, Mississippi.*—Proprietor.
Machine called "Wheelwright's Assistant."

117. Morse, Chamberlain & Co., *St. Johnsbury, Vermont.*—Manufacturers.
Model of a patent pivot blind machine.

118. Shepherd, Thomas, *Foxborough, Massachusetts.*—Proprietor.
Patent hand-rail and moulding machine.

119. Roberts, Milton, *Brook, Maine.*—Inventor and Manufacturer.
Machine for turning in wood.

120. Nichols, Olden, *Lowell, Mass.*—Patentee and Manufacturer.
Machine for cutting grain, peas, bark, corn, coal, &c.
Machine for picking mill-stones.
Machine for holding the irons of planes or moulding tools.

121. Harris, Jr., Joseph, *Boston, Massachusetts.*—Manufacturer and Proprietor.
Portable circular saw.
[The arbor frame, carrying the saw and its pulley, is held against the driving pulley by a spring; and is placed in such a position, that the act of feeding the stuff to be sawn, presses the saw pulley against the driving pulley.]

122. Lindsay, Thomas S., *New York.*—Inventor.
Treenail hole machine for boring at any angle.

123. Bruce, John, *New York.*—Patentee and Manufacturer.
Model of ship-biscuit machine, combined with revolving metallic-bottom oven.

124. Kennet, L. M., *St. Louis, Missouri.*—Proprietor.
Tobacco press.

125. Robinson, L. F., *Hartford, Connecticut.*—Manufacturer.
Burnap's Press, for laying veneers.
[With this ingenious machine, veneers laid on a curved surface are pressed by hydraulic pressure against a flexible sheet of India-rubber.]

126. Beardslee, George W., *Albany, New York.*—Inventor.
Machines for planing and tongueing and grooving lumber, dressing one or both sides of the board at once.
[This machine has a series of vertical plane irons, over which the board is traversed, and the connecting gear is of a peculiar construction.]

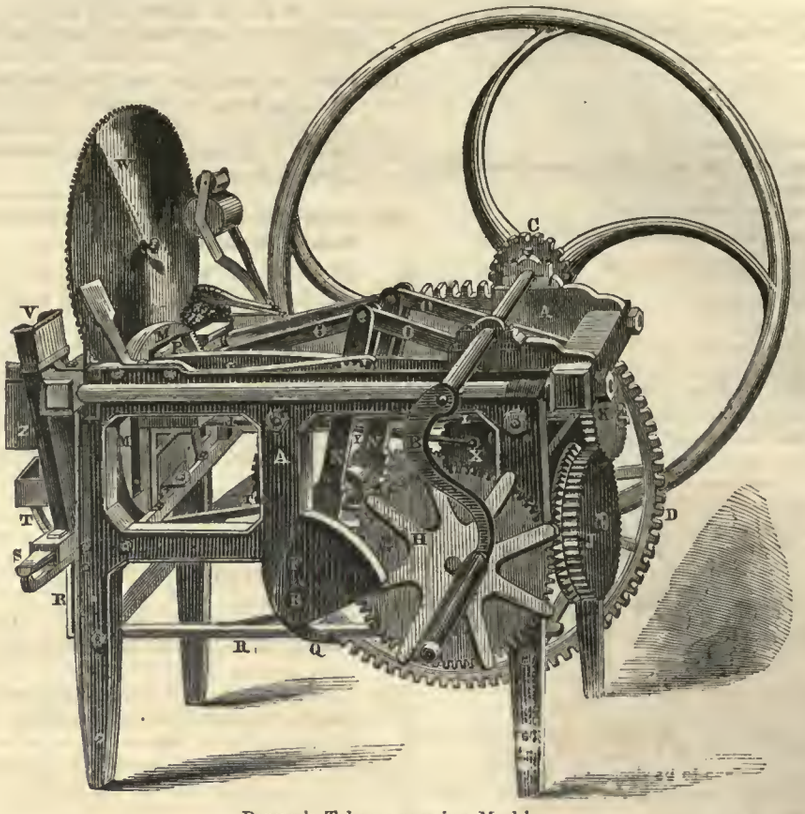
127. Standish, John, *Cuyahoga Falls, Ohio.*—Manufacturer.
Machine for pegging boots and shoes.

128. Drew, S. & W. G., *New York.*—Manufacturers.
Mahogany beer engine, with four pulls.

129. Hager, George, *Brooklyn, New York.*—Manufacturer.
Working machine for hulling rice.

130. Smith, T. Briggs, *Taunton, Massachusetts.*—Inventor.
Pulverizing mill of bevel wheel rollers, running by gearing in a circular pit.

131. Inoersoll, Platt C., *Elmira, New York.*—Inventor and Proprietor.
Patent centric pestle and mortar.



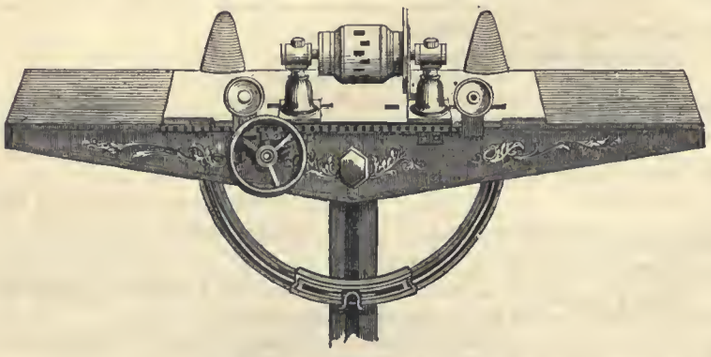
PARKER's Tobacco-pressing Machine.

132. IVES, HENRY, *West Meriden, Connecticut.*—Proprietor.
Cook's patent circular hand-saw, without cog or belt gearing.

133. WELLS & HILL, *Milwaukie, Wisconsin.*—Proprietors.
Stave dressing and jointing machine.

134. FAY, J. A., & Co., *Norwich, Connecticut.*—Manufacturers.
Sash, slat, and moulding machine.

135. OTIS & COTTLE, *Syracuse, New York.*—Proprietors and Manufacturers.
Machine for turning, boring, and mortising hubs—capable of making any variety of mortise, and regulating the stroke of the chisel to any depth.



OTIS & COTTLE's Mortising Machine.

136. CHAPIN, NATHAN, *New York.*—Patentee and Manufacturer.
Scroll and serpentine turning machine, for turning duplicate profile work for window blinds, and for cutting wood in every variety of fancy forms.

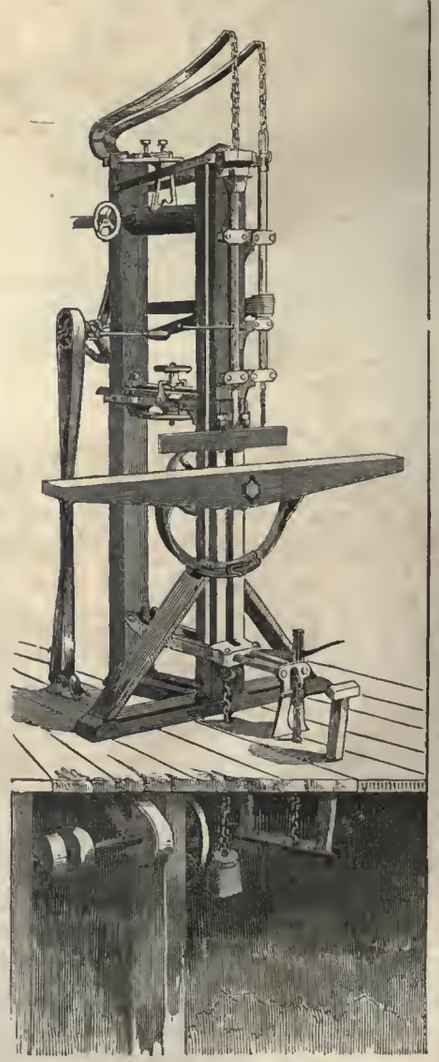
137. PARKER, ALFRED A., *St. Louis, Missouri.*—Proprietor.
Tobacco-plug machine press.

[The tobacco is pressed into a series of polished steel moulds by a toggle-joint movement, and the moulds, after being used several times, are thoroughly cleansed by the action of the machine from the oil and gum exuding from the tobacco.]

138. FRAZEE, BENJAMIN, *New York.*
Mully's Portable Saw-mill.

139. ANDREWS, WILLIAM, *Frederick, Maryland.*—Proprietor.
Improved bark-mill; cob-crushing machine.

140. NOYE, JOHN T., *Buffalo, New York.*—Patentee and Manufacturer.
Improved double-geared grist-mill and mill spindle; and a model of flour-packer.



OTIS & COTTLE's Mortising Machine.

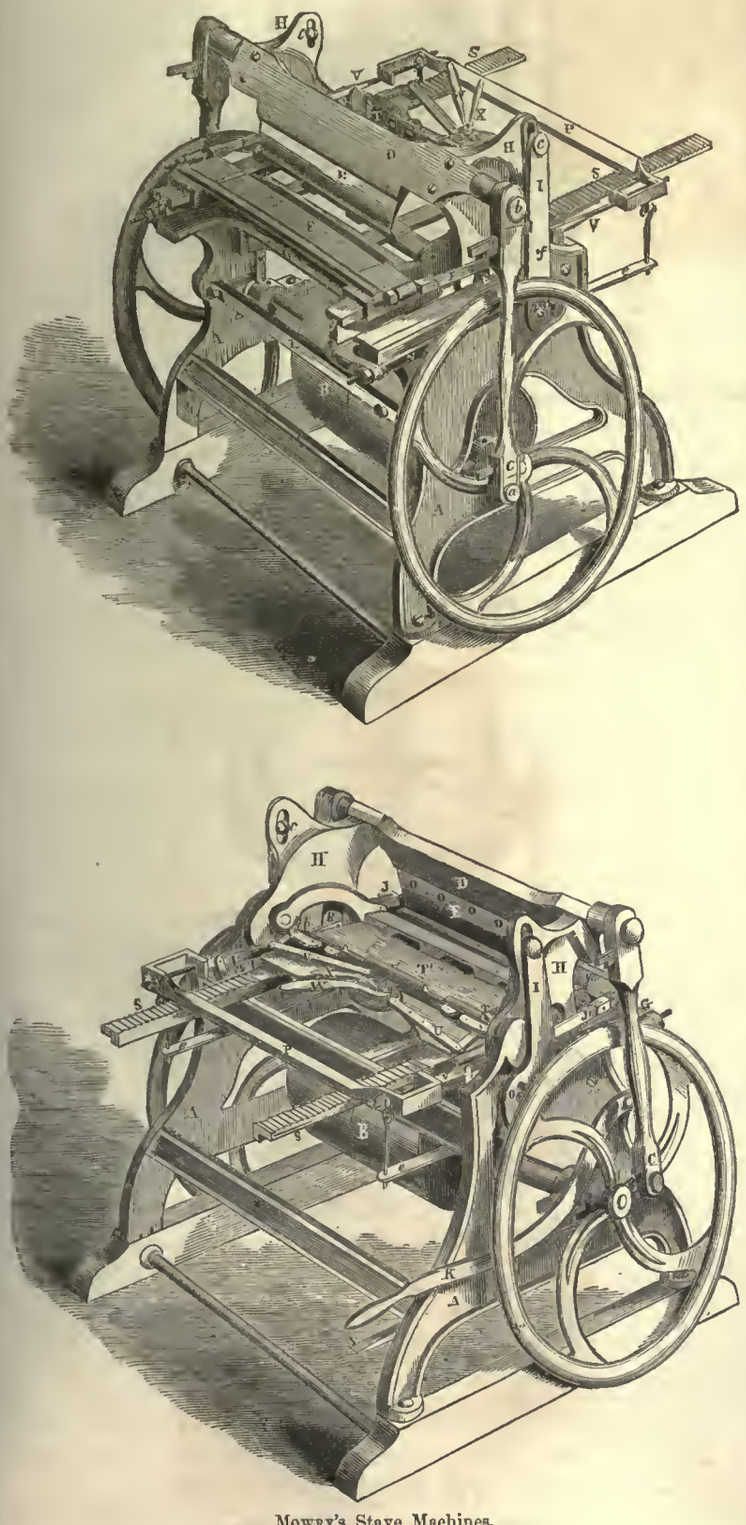
141. Nevins, Wm. R., *New York.*—Inventor and Patentee.
Biscuit and cracker machine, to manufacture 100 barrels of flour per diem.

142. Greenough, John J., *New York.*—Proprietor.
Miniature automaton shoe machine.

144. Sloan, William M., Agent for Wright, Rapp & Co., *Buffalo, New York.*—Manufacturer.
Upright saw, for scroll sawing, strained by atmospheric pressure.

146. Bemis, Charles W., *Waltham, Massachusetts.*—Manufacturer.
Machine for sawing lumber.

147. Gwynnes & Sheffield, *Urbana, Ohio.*—Proprietors and Manufacturers.
Mowry's Patent Machine for Cutting, Dressing, and Jointing Staves.



Mowry's Stave Machines.

[The log is first cut into bolts 4½ inches thick, and of the length of the desired stave, and, after being softened by steam or warm water, is fastened to the traversing-rack of this machine, which presents it to the action of a pair of horizontal knives, which cut it to the proper curve and level for the edges of a single stave. As these knives are withdrawn by the action of the machine, a third knife descends nearly vertically, and cuts the stave from the thickness of the bolt. This ascends, and the rack advances a distance equal to the thickness of the stave, and the operation is repeated for every stave.]

148. Stull, John, *Wilmington, Maryland.*—Inventor.
Model of a saw-mill.

150. Slayton, Phineas L., *Madison, Indiana.*—Inventor and Proprietor.
Planing machine for picket fences.

151. Sanford, Charles, *New York.*—Manufacturer and Proprietor.
Metallic corner dovetailing machine. (Davis' patent.)

[In this machine an inclined saw cuts the ends of the box to a miter joint, and a vertical saw cuts a slot, parallel to the joint, into which an angular clamp is fitted, and forms the corner, and holds the sides securely together.]

152. Steele, Henry & Co., *Jersey City, New Jersey.*—Manufacturers.
Planing machine and lathe.

153. Ross, Charles, *Rochester, New York.*—Proprietor and Manufacturer.
Patent, portable, conical, burr-stone mill.

154. Johnston, Joseph, *Wilmington, Delaware.*—Manufacturer.
Iron concave bran-duster.

155. Harris, F., & Son, *Elizabethtown, New Jersey.*—Manufacturers.
Scouring and smut machine.

156. Ashwell, Thomas, *New York.*—Inventor and Manufacturer.
Rotary machine for mincing sausage-meat.

157. Page, George, & Co., *Baltimore, Maryland.*—Manufacturers.
Portable saw-mill.

158. Dow, Mrs. C. C., *National Hotel, New York.*—Proprietor and Inventor.
Bonnet-pressing machine.

159. Gallahue, A. C., *Pittsburg, Pennsylvania.*—Inventor.
Machine for pegging boots and shoes.

160. Adams, N., & Son, *Amherst, Massachusetts.*—Manufacturers.
Felloe machine; designed to obviate the objections involved in the use of saws for cutting felloes, and produces the required curve smooth enough for all practical purposes.

[It has a substantial frame, with a table, on which the wood to be manufactured is secured by dogs of improved form, one of which passes through holes in the table, adapted to various radii of wheels, and is secured to an under-brace by means of keys; the other runs in a slot in the table, and is secured by set-screws. The gouges, or cutting-knives, are secured to opposite ends of a double-revolving bar, by sliding-stocks furnished with suitable set-screws and keys; one being used for cutting the inner, and the other the outer curve required. The compound bar is attached to a vertical shaft, driven by fast and loose pulleys. This is raised by an upright lever, and when in use feeds down towards the tube by a worm-wheel and endless screw-shaft, which is provided with a clutch and lever for throwing it in and out of gear.]

161. Stuart, Charles, *New York.*—Manufacturer.
Turning-lathe.

162. Holden, Moore, *Lawrenceville, Dearborn Co., Indiana.*—Patentee and Manufacturer.
Shear-cut, draft grist-mill.

163. Butler, E. T., *Buffalo, New York.*—Patentee and Manufacturer.
Portable flour-mill.

164. Gibson, John, *Albany, New York.*—Patentee and Manufacturer.
Woodworth Patent Machine, for Planing, Tonguing, and Grooving Timber.

[In the original arrangement of this machine, the boards under operation were fed in and worked in a vertical position; but, in the machine now exhibited, and used universally, they are worked horizontally. The feed motion is produced by a set of feed and pressure rollers, of which the lower has a stationary axle, and the upper is held on the board by weights or weighted levers; adapting itself, by this means, to any irregularity in the thickness. The first tool of the machine is a planing-cylinder, with knives secured to a brass stock, which revolves rapidly in a direction opposite to the motion of the board, dressing its surface with a "dip and lift cut," and working under the gritty surface of the board, so as to avoid dulling their edges. Behind this planing-cylinder a pressure-roller is placed, which keeps the board from lifting, under the planing operation. And behind this roller, on each side of the board, are revolving cutter-wheels, moving on axles at right angles to the axis of the planing-cylinder, and

so shaped that they form the tongue and groove on the edges of the board as it passes between them. The board is caused to leave the machine by the action of a pair of delivery-rollers.]

Woodworth's Patent Wood-moulding Machine.

[Similar in principle to the planing machine; the moulding being cut by a revolving cutter-wheel, pierced with knives of a shape corresponding to the section desired.]

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165. Harrison, Edward, *New Haven, Connecticut.*—Patentee and Manufacturer.
Self-cooling grist mill; so arranged that the stones do not come in contact with each other.

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167. Barber, Asa, *Hancock, Berkshire Co., Massachusetts.*—Inventor and Manufacturer.
Iron mill for grinding grain.
New coffee-mill; which cuts the bean instead of crushing it.
New bark-mill and corn-cracker.

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168. Saco Water-Power Company, *Biddeford, Maine.*—Manufacturers.
Two compound planing-machines or shaping engines, for planing the interior and exterior of curved surfaces.
Drawing-frames.

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169. Barlow, Nelson, *New York.*—Patentee and Proprietor.
Wood-planing and matching machine.

[The boards are traversed over stationary knives or planes by fluted rollers, and the knives have an independent cross motion.]

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170. Parsons, S. E., *Wilkesbarre, Pennsylvania.*—Agent.
Self-straining saw-irons for saw-mills.

[The invention consists in hanging the saw in advance of its front or cutting edge, in such a manner that the pressure of the log against it is in a line with the direction in which the carriage is advancing, effecting a strain of the saw by the friction of the brass on the front upper slide and by the action of the pit-man on the lower frame, thus dispensing with the heavy saw-gate which is usually required to strain the saw.]

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171. Dewitt & La Moree, *Napanoc, Ulster County, New York.*—Inventor and Patentee.
Revolving last-holder; designed to hold the boot or shoe-last while the workman is sewing, pegging, or nailing.

[It has a platform or bench, with two bearings, which carry a shaft with a curved arm. The boxes of the bearings are provided with screws, which, when loosened, permit the shaft to revolve so as to move the arm to any convenient position. A counter-balance is also attached to the shaft. On the curved end of the arm there is a collar in which the taper end of the last-holder fits, having a screw-thread cut on its lower end, on which a nut is fitted to secure the holder; by loosening the nut the holder is revolved freely. The holder is formed of two supports; one for the heel and the other for the toe of the last, the former being stationary, and having (passing through two projecting parts) a vertical screw which binds the heel in its position. The other support has a rest secured to it by means of a fulcrum pin, on which it turns by right and left hand screws, working in a link-nut, and admits of adjustment to lasts of various lengths. The top parts of the rests are made of proper shape to suit the form of the last. By bringing the holder in nearly a horizontal position, the screw which passes through the fixed support may be secured into a pair of clamps, to hold them in an upright position, convenient for closing boots and shoes. The machine is compact, easily made, and durable.]

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172. Townsend, W. H. & P., *New York.*—Proprietors.
Machine for testing the strength of iron.

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173. Barry, Samuel S., *Cleveland, Ohio.*—Patentee and Proprietor.
Model of metallic anti-friction hub and axle.

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174. McComb, D., *Memphis, Tennessee.*—Inventor.
Model of a press combining the principles of the double toggle-joint and pulley, for baling hay, hemp, and cotton.

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175. Handee & Hansfield, *Concord, New Hampshire.*—Inventors and Manufacturers.
New method of driving a circular saw, dispensing with the usual arbor attachment.

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176. Laverne, M. Jules, *New York.*—Inventor and Proprietor.
Model of machine for loading and unloading ships.

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177. Strait, Hiram, *Cincinnati, Ohio.*—Inventor.
Saw Doctor, for setting the teeth of saws.

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178. Fickett, H. E., *New York.*—Inventor.
Machine for filing saws by power.

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179. Arnott, W. D., *Washington, D. C.*—Inventor.
Model of a road-scraper.

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180. Gardner, George A., *New York.*—Patentee.
Patent steam machine for drilling blasts and wedge-holes, and for tunneling.

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181. Colton, David, *Poughkeepsie, New York.*—Inventor and Manufacturer.
Improved method of attaching spokes to the hubs of carriage-wheels.

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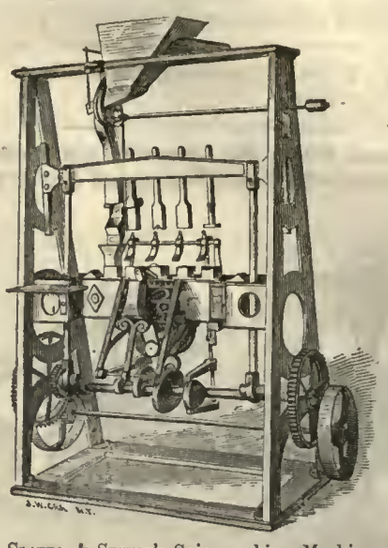
182. Slater & Steele, *Jersey City, New Jersey.*—Manufacturers.
Patent machine for weighing and packing ground spices.

[The material is measured into cups, in which the paper envelopes are folded, and passes under a series of dies by which it is compressed.]



Slater & Steele's Spice-packing Machine.

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183. Cotton, David, *Poughkeepsie, New York.*
Noiseless axles.

[An improvement by which boxes can always be kept tight, and a new mode of attaching spokes of wheels to hubs. The inside of the pipe-box is larger at the ends than at the middle, and is furnished with boxes correspondingly tapered, which may be screwed up to compensate for the wear. The spokes are secured by a shoulder inside the hub.]

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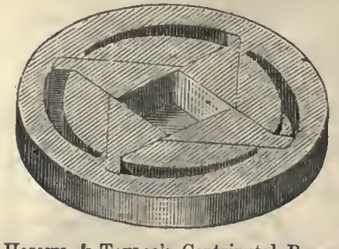
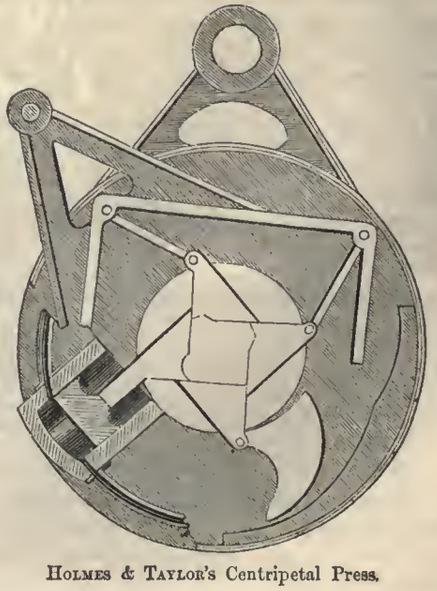
184. Holmes & Taylor, *Holyoke, Massachusetts.*—Proprietors.
Centripetal press, for pressing square in all directions.



Holmes & Taylor's Centripetal Press.



Holmes & Taylor's Centripetal Press.

186. Fonde, C. H., *New York.*—Proprietor.
Model of a dredging machine.

[The wheel carrying the scoops is adapted to the depth of the water by vertical screws; the scoops swing on centers, and are held in place by detents, which are detached by striking a cam when it is necessary to empty them.]

187. King, J. T., & Co., *New York.*—Patentee and Manufacturer.
Steam washing and dryihg machine; for laundries and hotels, and adapted to the use of families. The size on exhibition is said to wash 50 ordinary pieces per minute, without the rubbing, pressure, or friction, so injurious to the fabrics.

188. Minniss, Thomas E., *Madrid, Pennsylvania.*—Inventor.
Invalid locomotive chair.

GREAT BRITAIN AND IRELAND.

189. Straker, Samuel, *London.*—Manufacturer.
A side-lever, improved lithographic, press-registering machine; for chromo-lithographic or color printing.

190. Gibson, Wm., & Co., *Glasgow.*—Manufacturers.
Power and hand-loom shuttles.

191. Preston, Francis, *Manchester, England.*—Manufacturer.
Spinners and flyers used in preparing, spinning, and doubling cotton, silk, worsted, woolen, and flax.

192. Dart & Son, *Covent Garden, London.*—Manufacturers.
Two frames, illustrating the art of weaving coach lace, with specimens of ancient and modern manufacture.

193. Nicoll, H. J. & Donald, *Regent St., London.*—Proprietors.
Machine for cutting out clothes.

194. Blackmore, Walter, *Wandsworth, England.*—Proprietor.
Model of a bolting-mill, for dressing flour through patent bolting cloths, without seams, and with revolving gutta-percha flaps, for clearing the cloth while dressing.

195. Mason, John, *Globe Works, Rochdale, England.*—Inventor and Manufacturer.
Patent slubbing-frame, with patent collars, separating plates, disengaging and break motion, convex and concave cones. Patent roving frame, with the same improvements. Patent chuck, for millwright and machine purposes. Patent vice, for the same.

196. Faure, Theodore, *London.*—Inventor.
Snow-sweeping engine, for railways and common roads.

197. Bryan, Corcoran & Co., *Mark Lane, London.*—Manufacturers.
Paper machine wires.

198. Watson, H., *Newcastle-upon-Tyne, England.*—Manufacturer.
Patent pulp-stainer and frame for paper manufacturers.

199. Whitworth & Co., *Manchester.*—Manufacturers.
Patent, self-acting, duplex lathe, for sliding, screwing, and surfacing.

[This lathe has two cutting-tools, acting simultaneously on opposite sides of the work. The bed is 9 feet long, and has double-geared 8½-inch headstocks. The bearings of the collar and mandril are of cast-steel, case-hardened. The lathe is particularly adapted for sliding shafts, cutting screws, and turning surfaces. The carriage, or bottom-rest, is moved by a screw of the length of the bed, being connected with it by means of a nut, closed and opened by a handle on the left hand side of the rest, so that it may be connected with or disengaged from the guide-screw, as required.

The screw is connected, by change-wheels, with the mandril. Each change-wheel can be used, at pleasure, either on the guide-screw or the mandril, or as an intermediate wheel; thus a great number of permutations can be made, and a proportional number of screws be obtained.

On the right side of the bottom-rest is a screw-wheel that works in the guide-screw, and can be used for running the rest along the bed quickly by hand, and also for turning surfaces. When used for the latter purpose, it is geared to a right and left-handed screw, which works simultaneously two transverse slides on the bottom-rest. On these are fixed two compound slide-rests, that carry the two cutting-tools, which are placed in inverted positions as regards each other, and being brought to bear equally upon the work on opposite sides, the transverse forces are balanced, and all undue strain is obviated, and, while time is saved, the work produced is more correct.]

A patent, general shaping machine, for shaping levers, cranks, connecting-rods, &c.

[The bed of this machine is 5 feet long, having in front two parallel grooves, in which bolts connected with two tables slide; the tables can be fixed in any position required for supporting the work.

There is also in the center of the machines a mandril used in planing straight lines, and external and internal circular work, in combination.

The slide which is moved along the bed carries the tool-slide at right angles to it; and in front of this is fixed the tool-box on a vertical slide, working on a center with a segment-screw, for planing internal curves.

The tool has a uniform motion given to it while in the act of cutting, and is provided by the same means with a quick return motion.

This result is obtained by means of a crank fixed in a sliding-plate, having an axis working eccentrically to the wheel by which it is driven.

The horizontal, vertical, and circular motions of the machine, are made self-acting.]

Patent slotting and shaping machine, admitting work of 3 ft. 6 in. in diameter, and having a 12-inch stroke, and a vertical adjustment for its tool slide.

[The horizontal and upright part of the frame is cast in one piece, and the whole is cored out, thus forming double sides and imparting stiffness and strength to the tool while in operation.

The cutting tool has a uniform downward motion, and a quick return motion, provided by means of a crank fixed on a sliding plate, having an axis eccentric to the wheel by which it is driven. Horizontal slides, working at right angles to each other, are made to slide on the bed, and carry a table, having a circular motion, for supporting the work.

The horizontal and circular motions of this machine are self-acting.]

A patent self-acting planing machine, 9 feet long, 3 feet wide, and 3 feet high.

[The table is driven at a uniform rate both ways, and the cutting tool is made to reverse its position at the end of each cut, and so plane in both directions.

It is self-acting in the horizontal, vertical, and angular cuts.

All the slides of this machine, after being planed, are finished to true standard surfaces.]

A patent screwing machine, for cutting bolts and nuts.

[This machine cuts screws from ¼ inch to 2 inches in diameter, and is provided with 13 sets of dies and taps.

The bed carries a geared headstock with a hollow mandril, and the patent die-box is fixed upon it in any required position according to the length of the bolt.

The forward and backward motion of the mandril is obtained by means of a strap from the counter shaft, which is driven by a cross and straight strap from the main shaft.

In the patent die-box are four screwing dies, two of which cut in each direction; they are themselves cut up by a master tap, greater in diameter than the working tap, by twice the depth of the thread, thus enabling a screw of the correct pitch to be formed.

The angle at which these dies are moved forward, causes them to cut with as much facility as the screw tool in a lathe, producing shavings in a similar manner.

The threads and pitches of the screws are those which are technically called "Whitworth's Threads." They are now adopted by the English Admiralty, and are used throughout England, thus establishing a system of threads uniform for a given diameter.

They have also been introduced in some works in the United States.]

A patent guide screw stock.
A measuring machine.
[This machine is fully described in the Illustrated Record, page 33.]
Internal and external cylindrical gauges, of various sizes.
A street and road sweeping machine.

[The principle of this invention consists in employing the rotary motion of the wheels of a carriage, moved by horse or other power, to raise the loose soil from the surface of the ground, and deposit it in the vehicle attached.

The apparatus consists of a series of broad brooms, usually about 2 feet 6 inches wide, attached to two endless chains, running over an upper and lower set of pulleys, which are suspended in a light frame of wrought iron, hung behind a cart, the body of which is near the ground. As the cart-wheels revolve, they give rotary motion to the pulleys carrying the endless series of brooms, which, being made to bear on the ground, successively sweep the surface, and carry the soil up an incline, or carrier-plate, over the top of which it is thrown into the cart. The mechanism is exceedingly simple, and is not liable either to derangement, or to material injury from accident.]

FRANCE.

200. Villiet, Sen., J., *Paris.*—Manufacturer.
Apparatus for making effervescent water.

201. Gaillard, Ja., *La Ferté sous Jouarre, Seine and Marne.*—Manufacturer.
Various samples of millstones, for grinding all sorts of grain.

202. Charles & Co., *Paris.*—Manufacturers.
Novel machines, made of galvanized iron, or of copper, for bleaching linen; ice-cream churns, water and wine coolers, and knife cleaners.

203. De St. Hubert, E., *Bouvignes, Namur.*—Manufacturer.
Horizontal and perpendicular millstones.

204. Montcharmont, *Lo Tunetè, near Nevres, Nievre.*—Proprietor.
Millstones from Nevres quarry.

205. Roger, Jr., *La Ferté sous Jouarre, Seine and Marne.*—Manufacturer.
A variety of burr-stones.

206. Mondollet, Brothers, *Paris.*—Manufacturers.
Soda-water apparatus.

207. Schmautz, C., *Paris.*—Manufacturer.
Rollers, straps, and frames for lithographic and copper-plate printers.

208. Dubus, T., *Rouen, Seine Inférieur.*
Two cylinders for grinding emery.

209. Pugeot, C., & Co., *Audincourt, Doubs.*—Manufacturers.
Specimens of detached pieces of spinning machines.

210. Delcambre, A., *Paris.*—Agent.
Machine for setting and distributing type.

211. Senechal, Joseph, *Grenoble.*—Inventor.
Machine to measure the hand for gloves.

THE GERMAN STATES.

212. Kruess, Paul Nummel, *Hamburgh, North Germany.*—Inventor and Manufacturer.
Models of two machines for deepening rivers; a horizontal wind-mill; and a storm-anchor protector.

213. Thum, Leo, *Annaberg, Saxony.*—Manufacturer.
Specimens of weavers, reeds, of different qualities.

214. Michiels, J. Xavier, *Andernach, Rhenish Prussia.*—Manufacturer.
Millstones.

215. Brockhaus, T. A., *Leipsic, Saxony.*—Proprietor.
Machine for casting type, with instruments for two sizes of letters.

216. Reickborn, H., *Leipsic, Saxony.*—Manufacturer.
Machines to remove soot and dust from the narrow Russian chimneys. The essential principle consists of a brush furnished with a spring, with which it adapts itself to the varying widths of the chimney.

THE ITALIAN STATES.

217. Giordano, T., *Turin, Sardinia.*
Model of a machine for tunneling.

218. Repetti, Dr. Agostino, *Chiavari, Sardinia.*—Proprietor.
Steam-cylinder for heating baths.

SWITZERLAND.

219. Mathey, Auguste, & Son, *Locle, Canton Neuchatel.*—Manufacturers.
Flattening-rollers for watch-springs.

BELGIUM.

220. Jacquen, *Brussels.*—Inventor and Manufacturer.
Stocking-knitting machine.

221. Wynants, Corneille, *Brussels.*—Agent.
Notarial and seal-press, with specimens of seals.

THE NETHERLANDS.

222. Stoffels, H. de Severin, *Hecmestede.*—Inventor and Manufacturer
Models of elevating ladders, for fire-escapes and other purposes, and centrifugal water-wheel. The fire-escape consists of a truck carrying a jointed ladder, which is expanded and raised by a winch handle.

223. Hosewitz, J. M., *Eindhoven.*
Weavers' reeds.

SECTION II. CLASS VII.

CIVIL ENGINEERING AND BUILDING CONTRIVANCES.

THE present class occupies a large field of human industry. It includes whatever is connected with the construction of public works and private dwellings, and therefore embraces architectural and civil engineering in their widest sense.

The class, however, as it is represented in the present Exhibition, is by no means so rich in examples as might have been expected. One reason has been that the most important of architectural and engineering works are usually shown only by drawings. The great works of which our country is justly proud, its railways, canals, and the Croton Aqueduct, could not be exhibited within the narrow limits of the Crystal Palace. The Palace itself was the best exponent displayed at the Exhibition of our architectural taste and ability. The architectural section of the dome, and the several interior views published in the "ILLUSTRATED RECORD" of the Exhibition, sufficiently show the harmonious beauty of the design and the skillfulness of the construction.

A considerable number of bridges are shown, exhibiting a great diversity of structure and materials. An explanation of the principles of bridge construction, illustrated with engravings and descriptions of those exhibited, may be found in the ILLUSTRATED RECORD, page 55.

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1. O'NEIL, PATRICK, *South Brooklyn, New York.*—Designer.

Model of an elevated railway for Broadway, designed to extend over the roadway, between the curbs, from the Bowling Green to Union Park.

[The platform or upper street is of cast-iron plates, perforated for glass, and supported on wrought-iron beams and cast-iron girders, resting on cast-iron columns with granite bases. The columns and bases are hollow, forming a passage for surface-water, and for Croton and gas-pipes to the upper street. The platform will be about 18 feet above the main street and about 42 feet wide, of which 12 feet on each side is reserved as a promenade, and the central line, of 18 feet, for a double-track railroad. The cars will be propelled by a stationary engine and an endless wire rope, traveling on pullies six inches above the track, the car-brake being so constructed, that when operating against the wheels it is detached from the rope. Access to the upper street is provided for at each cross-street corner, by an iron staircase on the line of the curb. Short platforms also connect with the second stories of the line of buildings on each side.]

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2. FINK, ALBERT, *Baltimore, Maryland.*—Designer.

Model of a suspension-bridge; or, rather, a trussed-girder bridge. Illustrated on page 57 of the Record.

[Suspension-bridges are of two kinds:

1st. Bridges in which the weight of the roadway is suspended by vertical rods, chains, or wire ropes, to chains or cables which, passing over high piers, hang in catenary curves between them, and are firmly fastened to abutments.

2d. Bridges in which the roadway is suspended from rigid abutting arches of wood or iron, or both combined.

Bridges composed of a hollow iron plate or truss-work tube, such as the new Menai and Conway bridges, are often called suspension-bridges, but the propriety of such a name is by no means evident. They do not involve the peculiar suspension principle any more than the common forms of wood or stone bridges.

The principle of suspension consists essentially in the use of suspending rods, chains, or ropes, to sustain the weight of the roadway on flexible catenary or rigid arch supports above the road level. In rude and restricted forms, this system is of an ancient date: but the first truly systematic arrangement of the parts, as now used, is due to Mr. Finlay, whose patent, obtained in this country, dates back to 1801. It is, however, only since the fabrication of iron has been so wondrously perfected, that the full capacities of this method have been understood or employed. The strength of iron prescribes a limit to practicable spans which has never yet been fully reached. No mode of bridging approaches this in its capacity for spanning wide bays; hence many bridges are very practicable, on this plan, which would be totally impossible on any other system of construction. Now that the construction, capacities, proofs, and qualities of suspension-bridges, are so well established by experience, they are rapidly being erected in sundry localities where before bridging had been regarded as impracticable.

The following summary of several remarkable bridges exhibits, in part, what has been already done:

LOCALITY.	SPAN.	VERSED SINE.
Tweed, near Berwick, England, .	449 feet.	30 feet.
Menai Straits Bridge (Telford's), .	579,8 "	43 "
Hungerford and Lambeth Bridge,	676,5 "	50 "
Hammersmith Bridge, . . .	422 "	" "
Montrose Bridge, . . .	412 "	" "
Fribourg Bridge, Switzerland, .	870,32 "	63.26 "

Pesth, over the Danube, . . 670 " in one span, 1,250 clear water way

Bridge over the Dnieper, at Kieff, in Russia, has 6 bays; 4 of 444 feet, and 2 of 222 feet each. Now building.

Monongahela Bridge, at Pittsburg, has 8 bays, of from 188 to 190 feet each.

Nashville, Tenn., over the Cumberland, 538 feet span.

Wheeling Bridge, over the Ohio, 1,010 feet span.

The construction of the main chains, or cables, of a suspension-bridge, requires to be executed with great fidelity, and each component piece should be proved before using it. The end-fastenings, and the passings over the pier-tops, are critical points in the construction. The piers for wide spans require to be carried to such heights as to demand the best foundations and masonry. Nothing involves so much danger to a suspension-bridge as a lack of rigidity, either in the vertical or horizontal plane; for a deficiency of this kind permits oscillations to set in from high winds, from troops crossing in cadenced step, &c., which go on increasing until the chains or cables break, as was illustrated in a late disastrous instance. Perhaps these oscillations assist in time also to develop a crystalline structure, and consequent brittleness in the wrought-iron parts. Horizontal stiffness is usually produced by a horizontal truss combination in the floor-supports, and the vertical, by suspended lateral trusses. In railroad suspension-bridges, the need of vertical stiffness is still more imperative, though the great weight then suspended forms a decided check on oscillations. Proper proofs, inspections, and repairs of these bridges, are indispensable; but when all due precautions are taken, during and subsequent to the construction, there is no special reason for distrusting them.

In the second species of suspension-bridges, where the roadway is suspended on a rigid arch, abutting at the piers and abutments, the suspending rods are arranged on like principles. The supporting arch has been made of wooden solid-built beams of curved truss-work, and of cast-iron; the construction of the arches throughout being

similar to that when the road is above their crowns. In this form, when the whole arch is above the roadway, stability against high winds is rather difficult to insure, the center of gravity in each truss being much above the spring-line. The curved beam is often made to abut at some distance below the road-level, when the bridge is only partially suspended; as in the suspension-aqueduct over the Calder, at Stanley, England, in which the cast-iron arch has 155 feet span. In the Trenton Bridge, N. J., the curved beams abut at the road-level, though the center bay has 200 feet span, the two adjacent ones 180 feet each, and the other two end ones 160 feet each.

Various combinations of suspension and truss-work principles have been executed; but, in most cases, when skill in working iron can be freely commanded, a simple suspension construction seems preferable.]

3. Lanagan, Henry, *Boston, Massachusetts.*—Inventor.
Model of a bridge in wood and iron, and a model of a roof; both composed of a series of arched trusses, made of a combination of straight timber.

4. Jaeger, Wm. G. W., *Baltimore, Maryland.*—Proprietor.
Model of Scott's Patent Railway Suspension-bridge.

5. Bollman, Wendell, *Mount Clare Works, Baltimore, Maryland.*—Inventor.
Model of a railway suspension-bridge. See page 56 of the Record.

6. Allen, Wm. H., *Brooklyn, New York.*—Inventor and Manufacturer.
Model of a self-sustaining arch-truss bridge. Illustrated in page 56 of the Record.

7. Fretchsler, W. O. C., *Brooklyn, New York.*—Inventor.
Model of a suspension-bridge.

8. White, George H., *Springfield, Massachusetts.*—Proprietor.
Model of a bridge.

9. Howe, Hammond, *Cincinnati, Ohio.*—Manufacturer and Proprietor.
Model of a railway suspension-bridge. Fully described on page 57 of the Record.

10. Kime, F., *New Haven, Connecticut.*—Designer and Proprietor.
Model of a railroad bridge.

11. White, M. M., 39 *Wall Street, New York.*—Agent.
Model of an iron railway-bridge. (Col. Long's or Rider's patent.)

12. Wickersham, J. B., 312 *Broadway, New York.*—Designer.
Drawing of a plan for an elevated or balcony-railway and promenade in Broadway.

[This plan proposes an elevated side-walk or terrace over each side-walk of the main street. The terrace, with its columns and supports, to be made of iron; the flooring of flag-stones, resting on woven iron gratings supported by beams firmly bound together at the columns, and underlaid with corrugated iron, forming gutters, for the passage of such water as oozes between the stones, to the main canal through which it is led off by the columns to the lower gutters. The railway is laid on the outer line of the terrace, directly over the row of columns, which support its entire weight. The cars are to be drawn by horses, and the rails are to be laid on India-rubber, supported by wooden sills, to prevent noise. An ornamental and substantial iron railing incloses the track, with occasional openings from the promenade to admit passengers. Access to the terraces is had by staircases inside the building, and crossings are placed at intervals for passage from side to side.]

13. Randel, Jr., John, *Chesapeake City, Cecil County, Maryland.*—Designer and Inventor.
Model of an elevated railway for Broadway or other crowded thoroughfares.

[The cars are propelled by steam, on a railway elevated on columns placed at the edge of the side-walks. The chief feature peculiar to this plan is the arrangement for landing and taking up passengers without stopping the regular cars, by means of relay-cars.]

14. Dornbrach, Ferdinand, 60 *Chrystie Street, New York.*—Manufacturer.
Model of a patent ornamented pine floor, constructed without nails or visible joints; models of parquette floors; and a model of a circular staircase, sustained by its own weight.

15. Colwell, L., & Co., *27th Street, New York.*—Manufacturer.
Corinthian column of cast-iron.

16. Leroy, Leon, 99 *Duane Street, New York.*—Manufacturer.
Models of a roof, a funeral monument, a self-supplying fountain, and a cornice and console in zinc.

17. Casey, John, 122 *First Avenue, New York.*—Manufacturer.
Model of a Grecian conservatory, executed in satin-wood and mahogany.

18. Nowlan, Samuel, 31 *City Hall, New York.*—Inventor and Proprietor.
Specimen of a patent metallic pavement, composed of hexagonal plates, fitted with mortise and tenon-joints, and with the necessary projections to prevent slipping-cast on the surface.

19. Tuttle & Bailey, 293 *Pearl Street, New York.*—Manufacturers.
Various patterns of ventilators and hot-air registers.

20. Winckworth, James, 102 *Canal Street, New York.*—Manufacturer.
Specimens of modeling in card-board.

21. Culver, D., 52 *Cliff Street, New York.*—Manufacturer.
Variety of hot-air registers and ventilators.

22. Cooper, Minard T., *Pleasant Valley, Dutchess County, New York.*—Inventor and Manufacturer.
Gravitation door-closer.

23. Boot, Joan, *Chicago, Illinois.*—Inventor.
Model of a progressive coffer-dam for tunneling under rivers.

24. Andrews, Albert F., *Avon, Connecticut.*—Manufacturer.
Coil of water-proof safety-fuse for blasting, &c.

25. McDougal, C. B., 474 *Hudson Street, New York.*—Manufacturer.
Ventilated window-awnings for dwellings, offices, &c. It is hung on a light iron swinging-frame, and is bailed up by cords.

26. McMurray & Powley, *St. Louis, Missouri.*—Proprietors.
Patent iron door for prison cells, in which neither the lock nor the hinges are accessible to the prison.

27. Philips, N. M., & Co., 480 *Broadway, New York.*—Manufacturers.
Mathewson's Patent Weather-strip. The same applied to a model of a door.

28. Gibbs, John W., 36 *Maiden Lane, New York.*—Painter.
Ornamental sign of white crystallized ground, with gold letters.

29. Brandon, A & G., 4 *Tryon Row, New York.*—Manufacturers.
Various specimens of signs in writing, block, and fancy letters, in gold and colors.

[The effect of signs on the architectural character of fronts, especially in closely built cities, is usually but imperfectly appreciated. Cases are not unfrequent in which thousands of dollars are expended on the fine cutting and ornamental finish of sand-stone, marble, or granite fronts, which are at last so overlaid with sign-boards that all architectural beauty is destroyed, and a species of deformity substituted. There are fixed principles, doubtless, which should be constantly borne in mind in this, as in all other matters of design.

In the first place, the character of signs to be employed—their sizes, positions, style of lettering, color, and composition, are all truly essential points to be considered in designing the front on which they are to figure. A front on which numerous and conspicuous signs are to be mounted, ought to be made plain, and rather unmeaning since the sign-board fresco will surely clash with decided meanings, unless it hides them. Expensive ornament, in such a case, is worse than thrown away. Throughout each front, the character of signs should be uniform, and should be rigidly adhered to. Change of occupancy need not change the style of signs, however it may affect their matter.

In determining the character of signs, it is well to remember that simple intelligibility is the first essential, which ought as little as possible to mar the architecture. As signs must always be detracting elements, they should be kept as small as distinctness permits, and placed where they will least deface the front. Harmony of color is particularly important, and there is especial need of guarding against that glaring and utterly offensive display of bright colors which rude taste is prone to patronize. A sign can hardly be made, with propriety, to advertise more than a name and a business. The letters used ought to be very distinct and simple in style; the block letter being for elevated locations, rather, the best, and also being less liable to be deformed from lack of skill. For shingles and low signs, the pure English letter, when well made, is peculiarly clear, neat, and appropriate. Complex, fantastic, and gaudily colored sign-letters, are a public nuisance.

Business streets take a great part of their general expression and aspect from the signs used along their sides, as can well be realized by conceiving the effect on Broadway or Wall St. of removing all the signs. There is, perhaps, more offending against good taste, more outrage on architecture, and less of becoming modesty displayed in street-signs, than in any other item. A reform is greatly needed; and, indeed, many recent buildings indicate that, through instinct or reason, it is already begun.]

30. Cragin, Benjamin F., 20 *Nassau Street, New York.*—Proprietor and Manufacturer.
Block-letters for signs, carved by machinery, and gilded.

31. Laning, Wm. M., *Baltimore, Maryland.*—Designer and Manufacturer.
Elizabethan block-letter sign, and block-letter foliated script sign.

32. Holmes & Butler, 122 *Water Street, New York.*—Proprietors.
Model of a new ventilator.

33. Nutting, Michill, *Beverly, Massachusetts.*—Proprietor and Manufacturer.
New and improved style of window-sash.

34. Mueller, E., & Morrell, C., 121 *Third Avenue, New York.*—Stair-builders.
Ground and elevation plans of a staircase.

35. Pell, Alfred, 3 *Great Jones Street, New York.*—Inventor.
Fire-proof flooring, composed of cast-iron girders filled in with cement.

36. Pierce, Oliver B., *Rome, New York.*—Designer and Manufacturer.
Model of a patent fire-safety staircase.

37. Cannon & Brothers, 134 *Chapel Street, New Haven, Connecticut.*—Manufacturers.
Camp's Ventilator and Chimney Cap; an ingenious combination of planes, well gotten up.

38. Barnard, A. B., 94 *Wall Street, New York.*—Manufacturer.
New chestnut-door.

39. Ford, Franklin, *Philadelphia, Pennsylvania.*—Proprietor and Manufacturer.
Patent Venetian Blinds.

[In this simple and useful invention there is combined with the ordinary blind, which is raised or lowered from the bottom, a second arrangement, by which it may be lowered from the top, leaving the upper portion of the window entirely unobstructed.]

40. Doughty, J. H., 387 *Grand Street, New York.*—Manufacturer.
Specimens of carved capitals for columns; carved and sawed trusses and brackets for cornices; ornamental sawed and turned picket-fence; cornices of various styles; veneered stair-newells; and ornamental signs and sign-boards for stores, &c.

41. Dubois, J. G., & Co., 306 *West Thirteenth Street, New York.*—Manufacturers.
New style of parlor-door.

BRITISH COLONIES—CANADA.

42. Chatre, Z., *Quebec.*—Inventor and Manufacturer.
Model, with drawings and description of a tubular hot-iron furnace.

43. Holwell, W. Antaobus, *Quebec.*—Inventor.
Models and descriptive drawings of warming and ventilating apparatus and contrivances.

44. Austin, H. W., *Quebec.*—Civil Engineer.
Architectural drawing.

45. Ostele, John, *Montreal.*
Doors and door-frame, with architrave, made by machinery.

FRANCE.

46. Durand, H., *Bayonne, B. Pyrénées.*
Designs for churches.

47. Tordeux, A. J., *Cambrai, Nord.*—Designer.
Model in wood of a machine used in the construction of factory chimneys.

THE GERMAN STATES.

48. Bitterlich, Carl, *Breslau-on-the-Oder, Prussia.*
Zinc model of the council-house in Posen.

THE ITALIAN STATES.

49. Santi, Clemente, *Montaleino, Tuscany.*—Manufacturer.
Specimens of floating (light) bricks, made without baking, from fossil flour found on Castel del Piano, near Sienna.

THE NETHERLANDS.

50. Beckerer, G., *Groningen.*—Designer.
Models of winding and circular staircases.

SECTION II. CLASS VIII.

NAVAL ARCHITECTURE, ORDNANCE, ARMOR, AND ACCOUTREMENTS.

THE present class includes two distinct series of objects; naval architecture and whatever relates to the equipment of vessels, and ordnance with arms and means of general military equipment. The first series is illustrated by numerous models of vessels, both sailing and steam ships, and several yachts and life-boats. The general principles of naval construction and of life-boats are discussed in an essay in the ILLUSTRATED RECORD, page 87.

The second series of the class is more completely represented than the first. An interesting collection of ancient arms and complete suits of armor, sent from the Tower of London, are in striking contrast with the modern weapons near them. The Government of the United States have allowed the exhibition of a large collection of field ordnance and their equipments, and the small arms manufactured at the government establishments of Springfield and Harper's Ferry. It is to be regretted that the ingenious and perfect series of machines and tools, by which these arms are made, could not have been shown in connection with them. These machines exhibit the perfection of mechanical contrivance, and their successful operation has recently been referred to in the British Parliament as an authoritative precedent for similar establishments in England.

Beautiful specimens of swords are shown of American manufacture, and a large display is made of repeating fire-arms, an invention which was first brought into successful use in this country. The particular character of these arms will sufficiently appear from the following catalogue and the notes appended to it.

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1. DARLING, EDMUND THOMAS, *Fort Jefferson, Long Island, New York.*—Builder.
Model of a fully rigged, fancy yacht.

2. RAYMOND, LEWIS, *Avenue D, New York.*—Patentee and Manufacturer.
Improved life-boat, of galvanized iron, fitted with side and end air-chambers, and self-acting bailing-valves.

3. UNDERHILL, ROBERT, *East Broadway, New York.*—Shipbuilder.
Model of a ship's hull.

4. FRANCIS' METALLIC LIFE-BOAT COMPANY, *Office,* 10 *Broadway, New York.*
Man-of-war cutter, 31 feet long, made entirely of copper, and furnished with air-chambers, which constitute it a life-boat.

5. GRANS, JENS, *Boston, Massachusetts.*—Designer and Maker.
Two models of clipper ships.

6. COPLY, FREDERICK S., *Brooklyn, New York.*—Inventor.
Model of a yacht, with a double keel. Illustrated on page 89 of the Record.

7. FELLOWS, GEORGE W., *New York.*—Engineer.
Model of a patent method of ship-building.

8. BROOKS, THOMAS, *Portsmouth, Virginia.*—Designer.
Model of a ship.

9. FANNIN, L., *New York.*—Designer and Builder.
Model of a yacht-rigged cutter.

10. BARTLETT, —, *Green Point, New York.*—Designer.
Model of a sloop-of-war of twenty-two guns.

11. LILLIE, WILLIAM A., *New York.*—Shipbuilder.
Model of a clipper ship, constructed to exhibit the diagonals.

12. WESTERVELT, DANIEL D., *New York.*—Shipbuilder.
Skeleton model of a clipper ship, showing the arrangement of beams, timbers, &c.
Model of pilot-boat "Enchantress."

13. CROLIUS, WILLIAM, *New York.*—Designer and Maker.
Model for a clipper corvette, or first-class sloop-of-war, of 216 feet in length between perpendiculars, 46 feet beam, 26 feet depth of hold, to carry 22 8-inch Paixhan gun, to throw 68 lb. shot, and 2 10-inch, one forward the other abaft, to throw 134 lb. shot.

14. WEED, H. A., *Brooklyn, New York.*
Working model of a steamboat.

15. DEKKE, A., *Boston, Massachusetts.*—Designer and Maker.
Model of a clipper ship.

16. CHRISTIAN, S. S.—Designer.
Models of a steamboat and a pilot-boat.

17. DAVIDSON, D., *New York.*—Designer.
Half-model of a proposed steamer.

18. WHITLOCK, NICHOLS & Co., *New York.*
Model of a steamboat.

19. SMITH & DIMON, *New York.*—Shipbuilders.
Half-models of steamships "Illinois" and "Georgia." See page 89 of the Record.

20. KEPPEL, CHARLES, *Baltimore, Maryland.*—Designer.
Model of a steamboat, proposed by the designer to make the voyage to Liverpool in thirty-six hours.

21. SMITH, JOHN, *New York.*—Designer.
Model of ship "Ione" at sea.

22. WRIGHT, GEORGE, *New York.*—Designer.
Model of ship "Josephine."

23. GROTECLOSS, J. H., *New York.*—Designer.
Half-model of a steamship, with a side-screw propeller with light blades. The propeller is nearly three times its diameter in length.

24. COLLYER & ROZURS, *Nineteenth St., New York.*—Shipbuilders.
Model of the steamship "Black Warrior."

27. Harding, W. R., *New York.*—Proprietor.
Thompson's nautical life-bucket and stool. It is a double-cylinder, or bucket, with the intervening space filled with cork.

28. Ingersoll, Charles L., *New York.*—Manufacturer.
Clincker-built row-boat, of cedar and oak, varnished and copper-fastened.

29. Kentish, William A., *New York.*—Patentee and Proprietor.
Patent safety-anchors, single and double. The stocks of these anchors have a semi-rotary motion, and are furnished with palms, which assist those on the flukes in holding.

30. Perley, Charles, *New York.*—Manufacturer.
Ship-ventilators, windlass, and capstan.

31. Young & Stiles, *New York.*—Patentees and Manufacturers.
Improved capstan. [Patent applied for.]

32. Page, Ezekiel, *Erie County, Pennsylvania.*—Manufacturer.
Boat-oars and sweeps, manufactured by machinery from the log.

33. Simpson, C. B., *New York.*—Manufacturer.
Brass-wheel blocks, shears, eye-bolts, butts, ship-hinges and hasps, and all kinds of brass hardware for naval purposes.

34. Tucker, James, *Washington City, District of Columbia.*—Inventor.
Grapnel, with a hinge on the shank.

35. Merrill, Robert, *New York.*—Manufacturer.
Ship's binnacle, in rosewood, and ship-compasses, with illuminated dials.

36. Cooke, Benjamin F., *Boston, Massachusetts.*—Inventor.
Model, exhibiting a new method of caulking vessels, with India-rubber or other elastic substances. It is essential that the seams of ships should be filled with some elastic substance, which will accommodate itself to the working of the joints; and for this end, the tarred oakum, which has usually been used with pitch for the purpose, is proposed to be superseded by the more elastic India-rubber.

36a. Bonnell, John P., *New York.*—Manufacturer.
Patent ship's blocks.

37. Edson, Nathaniel F., *New Orleans, Louisiana.*—Proprietor.
Model of a steering-wheel for ships, with which the helmsman cannot be thrown by a sea striking the rudder.

38. Griffin, Daniel, 47 *Dey St., New York.*—Designer and Manufacturer.
Model of a steamboat-wheel.

39. Robinson, Warren, 31 *Bradley St., New Haven, Conn.*—Patentee and Manufacturer.
Patent ship-ventilators.

40. Maull, James, *Delaware Avenue, Philadelphia, Pennsylvania.*—Patentee.
Patent horizontal topsail, and patent seam-canvas for sails, and models for main and top-gallant sails. The canvas of these sails is sewed with horizontal seams, and strengthened by diagonal strips.

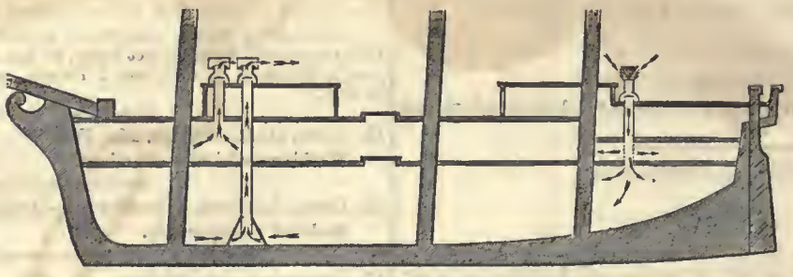
41. Emerson, Frederick, *Boston, Massachusetts.*—Proprietor.
Patent corresponding ship-ventilators, and model to show their operation. These ventilators are in pairs; of which one deflects a current of air down the pipe to the interior of the vessel, and the action of the other promotes the current up, and out from its pipe. Frustums of cones are the deflecting planes used in both. The annexed engravings show clearly the construction of the ventilators, and how they are applied to a vessel.

Injecting Ventilator.

Ejecting Ventilator.

Section.

Section.



Section of a Ventilated Ship.

42. Walker & Son, Robert S., *New York.*—Manufacturers.
American, British, and French national flags.

43. Reed, Caleb, *Boston, Massachusetts.*—Patentee.
Patent ship-steerer.

44. Burr, Waterman & Co., *New York.*—Manufacturers.
Waterman & Russell's patent ship's blocks.

45. Corbierre & Tucker, *New York.*—Manufacturers.
Life-preservers.

46. Hobbs, John W., *Boston, Massachusetts.*—Manufacturer.
Capstan for ships and steamboats.

47. Tewksbury, G. P., *Boston, Massachusetts.*—Patentee and Manufacturer.
Life-preserving stools.

48. Derby & Co., F., *New York.*—Manufacturers.
Full-dress uniforms of the commissioned officers of the United States Army and Navy, made from blue cloth manufactured by Slater & Sons, of Webster, Mass.

[In 1851, an order was issued by command of Major General Scott, establishing the uniform of the United States Army as it now exists. The old uniform, established under General Macomb, had been found in the war with Mexico to be open to grave objections. The fundamental idea of a full dress, distinct from the undress, was much objected to, as involving two outfits where one should be made to suffice. The large cap, the complication and constraint of the full-dress uniform, prevented its being worn to any great extent during campaigns, and led to the almost exclusive use of the undress in various composite forms. On the score of its parade appearance, the old full dress was generally well liked, but the practical objection was so strongly felt in field operations that, shortly after the close of the Mexican war, a revision of the uniform was directed. A first essay was promulgated through the Army, in a partially experimental manner, but it gave so little satisfaction that it was soon abandoned and revoked. A board of officers was next convened in Washington to prepare a revised uniform, and, after remaining for some time in session, the uniform mainly as it now stands was reported. The system and details were to some extent modified in the War Department, and then the order above referred to was promulgated, positively requiring the new uniform, and prohibiting the old after January 1st, 1852 (extended till January 4th, 1852). It could not fail to be a matter of deep regret to lose all the service associations which clung to the old uniform, but on the whole the change has been welcome. The cap has been most disliked. It was, too, a ground of just complaint that such radical changes made in the uniform were ordered at the expense of the officers; no provision having been made for compensating the cost incident to such a change, involving an entire new outfit, and a sacrifice of the uniform wardrobe. In other services such provision is made. United States naval officers have been recently still more seriously victims of a change in uniform, theirs being from a less to a more costly and elaborate full dress.

The new uniform is based on the principle that the undress shall be convertible into the full dress by the simple addition of epaulettes, pompon, sword, belt, sash, &c., so that the full dress shall embrace the entire set of uniform articles. The frock coat of dark blue cloth, single-breasted for captains, lieutenants, and enlisted men, and double-breasted for the higher grades; the cloth trowsers throughout the year for all

officers and enlisted men, of light or sky blue for regimental officers and enlisted men, and dark blue for all other officers; the dark blue cloth cap, *à la chasseur*, with cover, and arranged to receive a pompon; the distinctive buttons of different corps and arms; the buff silk sash for general officers, the emerald green for medical officers, and the crimson silk net for all other officers; the distinctive swords, epaulettes and shoulder straps, and the dark blue cloak-overcoat, marked by distinctive braids and knots; these are the main features of the new uniform.

It is very certain that matters of uniform are of less radical importance in this country than in Europe, where such multitudes spend their lives in military dress, and it is devoutly to be hoped that their importance may long be limited to a few. The uniforms of militia officers and men, being generally designed for show more than for service, fall rather into the domain of taste than practical considerations. It is unfortunate that a perverse taste has made so many of them flashy and utterly absurd for all save gala-day displays.]

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49. Thornton, Grimsby & Co., *St. Louis, Missouri.*—Manufacturers.
Complete military equestrian equipments for major-general and colonel of the U. S. Army.

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50. Allen & Thurber, *Worcester, Massachusetts.*—Manufacturers.
Variety of fire-arms.

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51. Colt, Samuel, *Hartford, Connecticut.*—Manufacturer.
Various kinds of revolving fire-arms.

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52. Krider, John, *Philadelphia, Pennsylvania.*—Manufacturer.
Guns, rifles, and pistols.

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53. Sollace, Ronald D., *New York.*—Agent.
Anti-corrosive percussion-caps (United States Government style), for muskets and pistols.

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54. Marston Fire-arms Manufacturing Company, *Office*, 205 *Broadway, New York.*
Breech-loading and self-cleaning rifles, shot guns and pistols, self-cocking rifles and pistols, and prepared cartridges.

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55. Foster & Co., George P., *Princeton, New Jersey.*—Manufacturers.
Cast steel, patent muzzle, target rifle; iron-breeched sporting rifle, needle rifle, and needle carbine.

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56. Whitney, Eli, *New Haven, Connecticut.*—Manufacturer.
New model of an United States percussion rifle, new breech-loading fire-arms, and patent revolvers.

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57. Goldmark, Joseph, *New York.*—Manufacturer.
Percussion caps.

[In 1819 Mr. Forsyth proposed to replace the ordinary match locks and flint locks with detonating powder, placed in a small magazine attached to the lock. Copper caps charged with a fulminating powder, composed of mercury, nitric acid, and alcohol, are now universally used.]

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58. Capewell, Joseph T., *Woodbury, Connecticut.*—Manufacturer.
Shot belts and shot pouches.

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59. Horstmann & Sons, Wm. H., *Philadelphia, Pennsylvania.*—Manufacturers.
Military goods, passementerie, &c.

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60. Higley, W., *Hartford, Connecticut.*—Manufacturer.
Corcoran's repeating rifle and pistol.

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61. Sharp, C., *Hartford, Connecticut.*—Inventor and Manufacturer.
Patent primer, attached to a shot gun.

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62. Tracy & Brand, *Norwich, Connecticut.*—Proprietors and Manufacturers.
Improved percussion-lock whaling gun, and patent bomb lance, for killing whales.

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63. Columbian Iron Works, *Brooklyn, New York.*
Cook's patent repeating fire-arms.

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64. Wolfe, Gillespie & Co., *New York.*
Rifle in a case.

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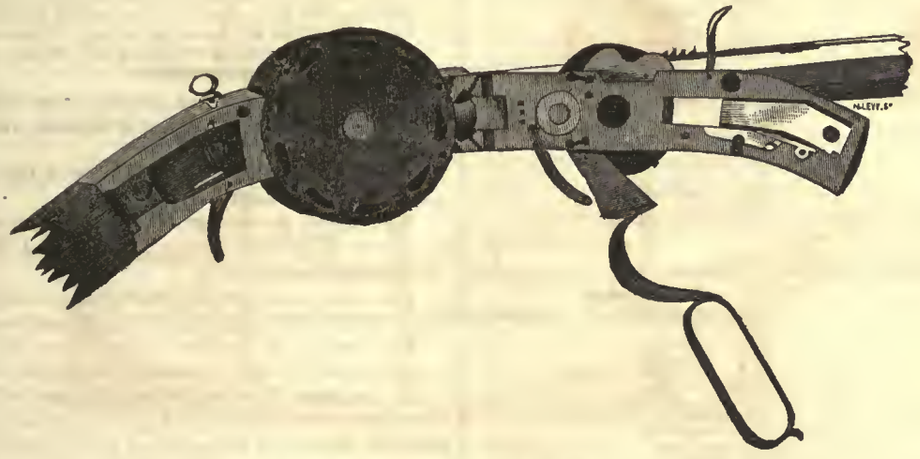
65. Porter, P. W., *Memphis, Tennessee.*—Inventor.
New revolving guns and pistols. Illustrated on page 49 of the Record.



Mechanism of Porter's Rifles.

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66. Foster, William, *Newark, New Jersey.*—Manufacturer.
A variety of powder flasks.

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67. Matthewman, John, *New Haven, Connecticut.*—Manufacturer.
Copper powder flasks.

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68. Ames Manufacturing Company, *Chicopee, Massachusetts.*—Manufacturers.
A complete suite of United States Army and Navy regulation swords, comprising:

United States	Field	. . .	Officers' sword.
"	"	Line	" "
"	"	Dragoon	" "
"	"	Staff	" "
"	"	Marine	" "
"	"	Non-Commissioned	" "
"	"	Revenue	" "
"	"	Medical staff	" "
"	"	Paymasters'	"
"	"	Cadets'	"
"	"	Engineers'	"
"	"	Topog. Engineers'	"
"	"	Horse Artillery officers'	"
"	"	" " privates'	"
"	"	Navy Boarding	"
"	"	Artillery	"
"	"	Musicians'	"

Collection of rich gold and silver mounted fancy swords.
Sword presented to Colonel Sylvanus Thayer, U. S. A. Engineers, formerly superintendent of the U. S. Military Academy, West Point, by his first class of graduates.
Sword presented by South Carolina to Colonel Benjamin Huger, Chief of Ordnance of General Scott's Army in Mexico.
Sword presented by South Carolina in memory of the gallant conduct of Captain James Stewart, Mounted Riflemen, U. S. A.
Sword, mounted in gold and precious stones, presented to General Worth, by Congress, at the close of the Mexican war.
Patent revolving pistols and sporting guns, with Maynard's self-primer attached.
For engravings of these pistols, see Illustrated Record, page 63.

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69. Ames, James T., *Chicopee, Massachusetts.*
Collection of arms belonging to the United States Government, and exhibited by permission.
Carriages and implements manufactured at the United States Arsenal, Watervliet, West Troy, New York.
One six-pounder field gun carriage, complete.
" " " Caisson "
One mountain howitzer carriage "
One traveling forge A "
One battery wagon C "

Implements and Ammunition for Six-pounder Carriage.

1 water bucket, leather.
1 tar " "
1 sponge " iron.
2 handspikes, trail.
1 Lanyard's friction-primer.
1 flint-stock.
1 priming-wire.
2 6-pdr. sponge-covers.
1 " tangent-scale.
2 thumb-stalls.
2 tape-pouches; 1 vent-punch.
85 6-pdr. shot, fixed.
10 " cannisters "
10 fuses, paper.

20 priming tubes.
40 friction "
1 cannon-lock.
1 lock-cover.
1 fuse plug-rammer.
1 gunners' gimlet.
2 " haversacks.
1 " pincers.
1 prolonge.

2 6-pdr. sponges and rammers.
1 tarpaulin, 12 × 15 ft.
1 tow-hook.
1 6-pdr. worm and staff.
5 " spherical case-shot, fixed.
2 " cartridges (1¼).
60 percussion-primers.
6 yds. slow-match.
4 port-fires.

Implements and Ammunition for Caisson.

1 water bucket, leather.
1 tar " iron.
1 handspike, trail.
1 shovel, Caisson.
2 tow-hooks.
105 6-pdr. shot, fixed.
15 " case-shot, "
30 " canisters, "
6 " cartridges.
30 fuses, paper, assorted.

1 tarpaulin, 12 × 15 ft.
1 pole, spare.
1 wheel, "
1 axe, felling.
1 " pick.
180 percussion-primers.
60 priming-tubes.
120 friction "
18 yds. slow-match.
12 port-fires.

Implements and Ammunition for Mountain Howitzer Carriage.

1 fuse plug-rammer.
1 gunners' gimlet.
1 " haversack.
1 " pincers.
2 Lanyard's friction-primer.
1 linstock.
1 priming-wire.
4 12-pdr. howitzer-shells, fixed.
10 " spherical case-shot.
10 priming-tubes.
20 friction "
1 pack-saddle and harness complete.

1 sponge-cover.
1 tarpaulin, 10 × 6.
1 sponge and rammer.
2 tube-pouches.
1 vent-cover.
1 handspike.
2 ammunition-chests.
2 12-pdr. howitzer canisters, fixed.
28 fuses, paper, assorted.
2 port-fires.
4 yds. slow-match.

Tools and Stores for Forge A.

1 tar bucket, iron.
1 water " wood.
1 water " leather.
5 kegs for ammunition-chests.
62 links, cold-short S. No. 3, 50; No. 5, 12.
2 lbs. nails, Nos. 1 and 2.
4 nave-bands.
44 nuts, assorted.
20 fire-bolts.
2 fire-bands.
8 washers' linch.
44 " bolt, assorted.
2 ft. chain-coil, Nos. 1 and 2.
12 files, assorted.
800 lbs. horses' shoes.
200 " iron bar.
1 lock (pad).
50 lbs. nails, horse-shoe.
2 rasps, horse-shoeing.
1 gross screws, wood.
5 lbs. steel, blister.
5 " " cast.
1 anvil.
2 aprons, smiths'.
1 buttress.
6 boxes B. W. stores.
1 " shoeing.
1 callipers.
2 chisels, cold.
2 " " hand.
2 " cutting hot iron.
1 creaser, smiths'.
4 dies, pairs.

1 die, stock.
1 fuller.
1 tarpaulin, 10 × 15 ft.
12 linch-pins.
1 hammer, hand.
1 " riveting.
1 " nailing.
1 " shoeing.
1 hardie.
1 iron, clenching.
1 knife, toe.
1 " shoeing.
1 nail, claw.
1 " set.
4 punches.
1 pincers.
1 poker.
1 pritchell.
1 shovel, smiths'.
1 " coal.
1 square, iron.
1 stone, oil.
1 sledge.
1 screw-driver.
4 taps, assorted.
1 tin can.
3 tongs, smiths'.
1 vice, hand.
1 wrench, screw.
1 " tap.
½ gall. oil, sperm.
1 broom, split.
½ ton coal, bituminous.

Tools and Stores for Battery Wagon C.

1 tar bucket, iron.
1 water " leather.
6 cannon, spikes.
1 gunners' callipers.
1 " gimlet, field.
12 nose-bags.
16 whips.
4 lanterns, common.
50 yds. slow-match.
1 elevating screw.
1 pole yoke.
1 stock battery-wagon.
4 6-pdr. rammer-heads.
4 " sponge "
6 bridles, artillery harness.
6 collars, "
12 chains, halter harness.
16 girths, "
6 halters' "
25 hame-straps, "
20 traces, leather "
5 lbs. thread, shoe.
2 " linen (patent).
½ gross buckles, black.
14 files, assorted.
2 locks (pad).
20 lbs. nails, cut.
3 lanterns, dark.

Lanyard's friction-tubes.
3 priming-wires, field.
1 prolonge, "
16 6-pdr. sponges.
3 " sponge-covers.
3 " sponge and rammers.
2 tarpaulins, 5 × 5.
1 " 12 × 15.
1 rasp, wood.
6½ lbs. sash-cords.
3 M tacks, iron.
2 lbs. beeswax.
50 lbs. tallow.
24 fellies.
40 spokes.
3 lbs. black-wax.
½ lb. bristles.
2 sides leather, bridle.
11½ lbs. " harness.
1 gall. oil, linseed.
½ " " sperm.
4 " " neat's-foot.
50 lbs. paint, mixed olive.
5 " " " black.
1 gall. spirits turpentine.
2 kegs packing.
5 lbs. candles, sperm.

Tools for Battery Wagon C.

3 axes, felling.
1 " picks.
1 " broad.
1 " hand.
1 adze, carpenters'.
3 augers, screw.
3 auger-handles.
11 awl "
1 awl, scratch.
1 " brad.
11 " saddlers'.
1 " strap.
1 brace.
14 bits, assorted.
11 brushes, paint.
8 boxes B. W. stores.
3 knives, shoe.
1 " saddlers', ½ round.
1 line-chalk.
1 mallet.

100 needles, assorted.
2 punches, saddlers'.
2 pincers.
1 pivers.
2 planes, bench.
2 " irons.
2 rules, carpenters'.
1 square, trying.
1 spoke-shave.
8 tin cans.
4 thimbles.
1 compasses, pair.
2 chisels, farriers'.
2 " framing.
1 creaser, saddlers'.
1 clam, saddlers'.
1 claw-tool.
24 corn-sacks.
12 gimlets.
2 gauges, carpenters'.

1 gauge, carpenters'
1 grindstone, small and crank.
2 hatchets, claw.
1 hammer, "
1 " saddlers'.
2 hooks, bill.
3 jacks, screw.
2 saws, hand.
1 " frame.
1 " tenon.
1 saw-set.

6 spades.
4 scythes, grass.
4 " sheaths.
4 " stones.
4 sickles.
1 stone, oil.
1 " sand.
3 shears, laborstory.
1 screw-driver.
1 vice-table.
1 wrench-screw.

Arms manufactured at the United States Armory, *Springfield, Massachusetts.*

2 cases, containing 30 U. S. muskets, and improvements of 1853.
1 " " 10 " cadet muskets and improvements.
1 " " 10 " artillery musketoons.
1 " " 10 " cavalry "
1 " " 10 " sappers' "
1 " containing samples of U. S. muskets, showing the alterations and improvements for a series of years.

Arms manufactured at the United States Armory, *Harper's Ferry.*

One case, containing 10 U. S. rifles.

Arms manufactured at *Middletown, Connecticut.*

One case, containing 40 dragoon-pistols.

Cannon manufactured for the United States Government, by Ames Manufacturing Company, *Chicopee, Massachusetts.*

2 6-pdr. bronze cannon, weighing each 884 pounds.
2 24-pdr. " " " " 1764 "
2 12-pdr. " howitzers, " " 787 "
2 32-pdr. " " " " 1925 "

GREAT BRITAIN AND IRELAND.

70. HER MAJESTY'S BOARD OF ORDNANCE.

Collection of arms and armor from the Tower of London, comprising:
Suit of armor of the time of Henry VIII. (1530), with effigy complete.
Suit of armor of the time of Queen Elizabeth (1590), with effigy complete.
Suit of armor of the time of Elizabeth (1595), with effigy complete.
Suit of armor for a cavalier of the time of Charles I. (1630), with effigy complete.
Suit of armor for a pikeman of the time of Charles II. (1665), with effigy complete.
Miscellaneous collection of ancient and modern arms, armor, engines, and implements of war of various descriptions.

[Arms serve for attack and parrying, armor solely for defense. In the fifteenth century, before the effective service of fire-arms was introduced, the following arms were in general use:—

For cavalry; the lance, the straight-sword, the dagger, the bow and arrow, the cross-bow, the mall, and the arzegi.

For infantry; the straight-sword, the spear or pike-staff, the battle-axe, the pike, the halberd, the partisan, the bow and arrow, and the cross-bow.

The defensive armor was:

For cavalry; the helmet or head-piece, the cuirass, the coat-of-mail, the coat-of-arms or tunic which covered the former, the corslet or light cuirass of wrought iron.

For infantry; the capellina or iron helmet, the mail-jacket, fitting close to the body, the basket-shield, and sometimes the complete corslet.

In 1256, Roger Bacon experimented on gunpowder, and about 1330, small cannon were first constructed, so as to be worked by hand. These grew in time into heavy artillery. About 1520, the arquebuss was extensively introduced, and after 1567 the match-lock became a common arm. In 1630, the flint-lock was invented, and the musket became essentially complete. The wooden-handled bayonet was added in 1671, and the socket-bayonet in 1699. Before these slowly improving fire-arms, defensive armor became gradually powerless for protection, and was by degrees abandoned, until now only the helmet and cuirass for dragoons, and the same made musket-proof for sappers and miners, are retained, and these not universally. The changes which have been effected in offensive arms, aside from fire-arms, are very marked, the present swords, &c., being in sundry respects characteristic of the time. No possible collection could belong more totally to past ages than the exhibited British arms and armor, nor has any modern discovery wrought a more complete and extensive revolution in a branch of fabrication than the discovery of gunpowder has effected in the manufacture of arms and armor. To the American public such an exhibition is peculiarly instructive, and grateful acknowledgments are due to the Board of Ordnance for these unique contributions from the Tower of London.]

The Ordnance-map of England and Wales, on the scale of one inch to the mile, in its present state of progress consists of 90 sheets, double-elephant size, mounted on linen, and forming a connected map 28¼ feet by 23 feet 5 inches.

Ordnance-map of the City of Liverpool, on the scale of five feet to a mile, mounted on linen, and forming a map of 26 by 15 feet.

Ordnance-map of Dublin.

Ordnance-map of Wigtonshire.

Ordnance-map of Lancashire, on the scale of six inches to a mile, mounted on linen, and forming a map 40 feet by 27 feet. The survey was commenced in 1841, and the engraving of the 112 sheets, of which it is composed, has just been completed. The physical relief and features of the ground are exhibited by a series of contour lines, or lines of equal altitude, at every 25 feet of vertical distance apart. A very large proportion of the ornamental work, and the whole of the altitude figures, are engraved

on the copper plates by the aid of stamps; and the tinting, or shading, is performed by steam-machinery, recently introduced.

[The exhibited maps of the ordnance surveys of England, Wales, and Ireland, are among the finest products of that extensive series of surveying operations which has long been progressing under the Ordnance Department of the British Army. The Irish map was undertaken as a basis for town-land valuations, and has been executed and engraved in the scale of six inches to the mile, the engraving being done in Dublin. A reduction of this to the scale of one inch to the mile is strongly demanded, and will doubtless soon be undertaken. The survey of England and Wales was made and engraved on the one-inch scale, except the six northern counties, which have been surveyed, and are being engraved on the six-inch scale. By engraving a reduction of these to the one-inch scale, the elaborate topographical map now exhibited will be completed, thus presenting one of the most perfect pictures of a whole country which has ever been executed. The six-inch survey will probably be extended over the entire United Kingdom, accompanied with contour lines. This will make up far the most sumptuous and extensive surveying operation ever yet undertaken. The whole organization for this great work is under the central direction of a director whose headquarters are at Southampton, England, and it is at this office that the work of computing, drawing, engraving, and electrotyping, is now consolidated. The execution of this costly survey was strongly demanded by the leading interests of Great Britain, and it is highly gratifying that such uninterrupted progress has marked its history. Its present direction bears evident marks of that union of liberal administrative policy with a scientific study of methods which alone is appropriate in a work of so national and peculiar a character.]

71. Denham, Edmund, *London.*—Inventor.
Iron life-boat, with buoyant, expanding fenders.

72. Dunn, Joseph, *New Durham.*—Inventor.
Model of a self-acting, ship alarm-whistle.

73. Hawker, Col. Peter, *Long Parish House, Hants.*—Inventor.
Model of an apparatus for improved ignition of cannon-powder.

74. Fyfe, Samuel Holborn, *Glasgow.*—Exhibitor.
Model of a British frigate, made by Robert Urie, painter.

75. Gilby, John, *Beverly, Yorkshire.*—Inventor.
Rifle to charge at the breech.

76. Walker, Richard, *Birmingham.*—Patentee and Manufacturer.
A case of percussion-caps, not loaded.

77. Eley, William & Charles, *Golden Square, London.*—Inventors and Manufacturers.
Sporting-ammunition, comprising wire-cartridges to use for long distances, percussion-caps impervious to water, bulleted breech-caps, metallic cartridges, concaved felt-wadding, &c.

78. Thompson, John, *Kent.*—Designer.
Model of a patent slip at the Royal Navy Yard, Harwich; and a model of Her Majesty's ship "Mars," of 80 guns.

79. Walker & Co., S., *Birmingham.*—Manufacturers.
Percussion-caps.

80. Manton & Son, I., *Piccadilly, London.*—Manufacturers.
Two double-guns.

81. Richards, Westley, *New Bond St., London.*—Manufacturer.
Guns, pistols, and powder-flasks.

BRITISH COLONIES—CANADA.

82. Hudson's Bay Company.—Proprietors.
Voyageurs' bark-canoe.

NEWFOUNDLAND.

83. Learney, Richard, *St. Johns.*—Designer.
Model of a ship's hull.

FRANCE.

84. Houllier, Blanchard, *Rue de Clery, Paris.*—Manufacturer.
Double-barreled gun, lined with platinum.

85. Coulaux, Sen., & Co., *Molsheim and Klingenthal, Bas Rhin.*—Manufacturers.
Side-arms and sabers.

84A. Rebanet, Montillier, *St. Etienne, Loire.*—Manufacturer.
Specimens of damask double-barrels, for hunting.

85B. Prelat, *Paris.*—Manufacturer.
Pair of pistols.

86. Faulon, A., 6 *Cité Odiot, Paris.*—Designer.
Model of a steamboat. See p. of the Record.

THE GERMAN STATES.

87. Tanner & Son, C. D., *Hanover, North Germany.*—Manufacturers
Pistols, double-barreled gun and rifle, in cases.

88. Sauer, F. J., *Solingen, Rhenish Prussia.*—Manufacturer.
Sabers, scimitars, daggers, &c.

89. Shuerigen, E. T., *Meissen, Bavaria.*—Patentee and Manufacturer.
Double-barreled percussion-gun, upon a new principle.

90. Klemm & Foerstner, *Ulm, Würtemberg.*—Manufacturers.
Hunting percussion-caps.

91. Pistor, G. & W., *Schmalkalden, Hesse-Cassel.*—Manufacturers.
Rifle-gun, with barrel of German cast-steel.

92. Crause, C. P., *Hersberg-in-the-Harz.*—Manufacturer.
Rifles of new style, and pistols.

93. Funk & Sons, J. V., *Suhl, Prussia.*—Manufacturers.
Rifle-gun, with rose-damasked barrels.

94. Dreyse & Collenbusch, *Sommerda, Prussian Saxony.*—Manufacturers.
Needle-guns and water-proof percussion-caps.

95. Eickhorn (Widow) & Son, *Solingen, Prussia.*—Manufacturers.
Damascined swords.

96. Mergenroth, C. & A., *Gernerode, Hanover.*—Manufacturers.
Pair of pistols, in case.

97. Hoestery, J. P., *Barmen, Prussia.*—Manufacturer.
Percussion-caps.

AUSTRIAN EMPIRE.

98. Sellier & Bellot, *Prague, Bohemia.*—Manufacturers.
Patent copper percussion-caps.

99. Schaschl, Valentine, *Ferlach, Carinthia.*—Manufacturer.
Specimens of fire-arms and gun-hardware.

100. Kiemer, J., *Pesth, Hungary.*—Manufacturer.
Double-barreled gun and a pair of pistols.

101. Nowak, F., *Prague, Bohemia.*—Manufacturer.
Double-barreled gun and target-pistols.

SWITZERLAND.

102. Schlaepfer, J., *Glarus, Canton Glarus.*—Manufacturer.
Rifle and appurtenances.

BELGIUM.

103. Petry, J. Aug., *Liege.*—Manufacturer.
Specimens of every description of fire-arms, including fowling-pieces, muskets, carbines, pistols, &c.; and sabers and military armament.

104. Schepers, Francois, *Liege.*—Manufacturer.
A variety of fire-arms.

105. Falisse & Trapmann, *Liege.*—Manufacturers.
Rifles, guns, pistols, and percussion-caps.

106. L'Honneux, J. P., *Liege.*—Manufacturer.
Eight double-barreled guns.

SECTION II. CLASS IX.

AGRICULTURAL AND HORTICULTURAL MACHINES AND IMPLEMENTS.

In the American Department of the Exhibition, the present class occupied a very large space, and was justly regarded as one of the most interesting divisions, and highly creditable to the mechanical genius of our countrymen. The periodical exhibitions of agricultural and horticultural implements and products, held so generally throughout the country during the past few years, and the liberal official and private patronage extended to them, have caused improvements to be introduced with unusual and gratifying rapidity. Many of the machines and implements appear to have reached the limits of economy, efficiency, and convenience, and to be susceptible of no further improvement. In particular, this is true of American plows, hoes, and similar implements, and of some of the separators and machines of a like kind. The reapers, which illustrate so well the ingenuity and fertility of invention of Americans, are fully represented in the exhibition. Horse-powers, another American invention, are also shown in a variety of excellent examples. Were it consistent with the design of this work, it would be a pleasing task to cite and commend individual instances of merit in this class; such merit will not fail to secure attention upon an examination of the articles exhibited. The collection of models illustrating the fruits cultivated in the United States, and the various insect depredators which prey upon them, is deserving of particular attention for its novelty and importance.

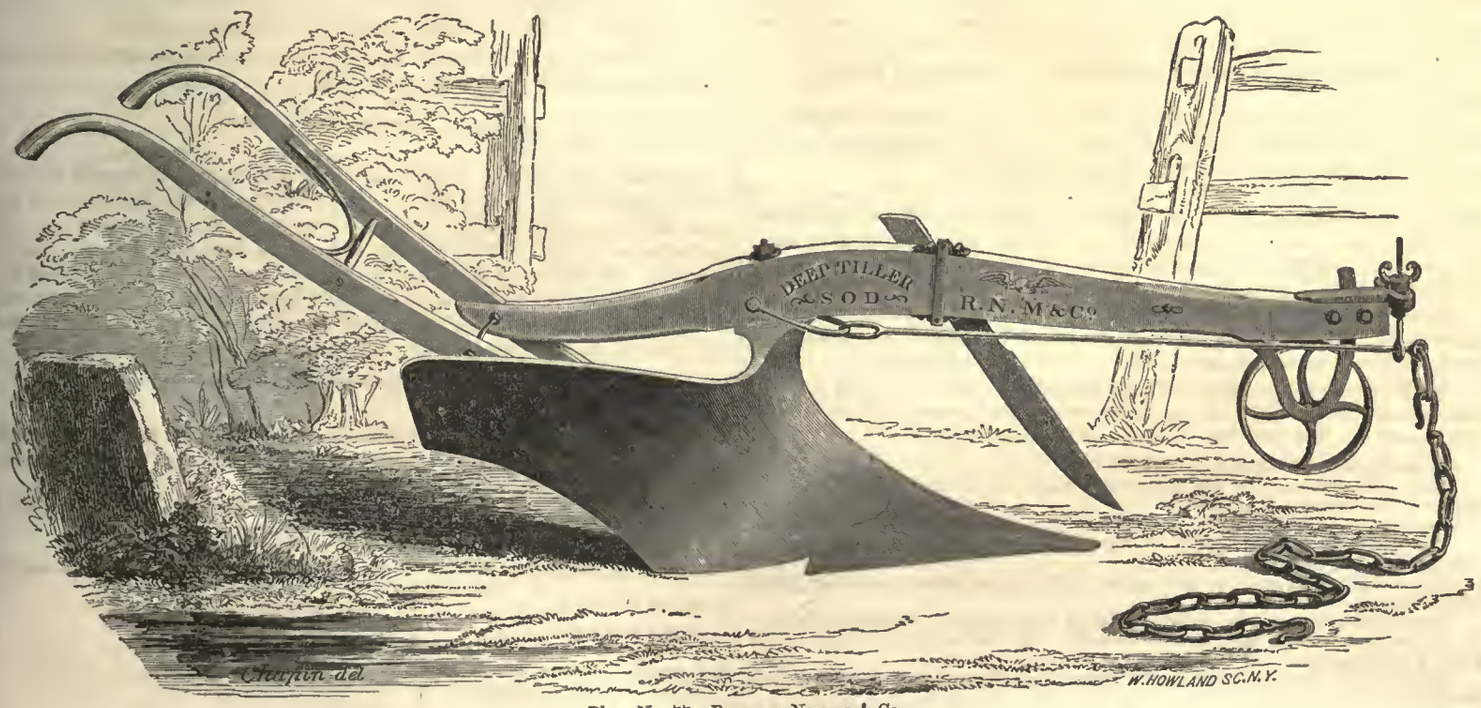
The class is conveniently divided into several sections:—Implements for sowing, manuring, hoeing, &c.; Machines for harvesting; Barn machinery, threshers, &c.; Machinery for the preparation of food for cattle, &c.; Agricultural carriages and gear; Machines and apparatus for drainage; Dairy implements; Miscellaneous farming implements; Garden-engines and tools.

The whole number of exhibitors in this class is 145; of these 117 are from the United States; 3 from England; 5 from Canada. France sends but 3; the German States, 3; Austria, 9, all of whom exhibit scythes; Italy, 2; Belgium, 1; and the Netherlands, 2. From this very unequal representation of foreign countries, no very extensive comparisons could be made between their agricultural implements and our own. Such as could be made, however, were entirely advantageous to the American exhibitors.

1. Ruggles, Nourse, Mason & Co., *Boston and Worcester, Mass.*—Manufacturers.

A series of Eagle Plows, constructed for deep tilling, according to a scale of proportions embracing a variety of sizes and patterns adapted to every kind of soil. The scale admits longer or shorter mould-boards, with lateral straight or curved lines, presenting an equal bearing against the entire surface of the furrow-slice, so that the flexure of the slices is everywhere even, and the soil thoroughly pulverized.

[Plow No. 77, here engraved, is the largest of the series, cutting furrow-slices 9 to 13 inches deep, and 15 to 17 wide. In stiff soils, filled with tangled roots, it is worked by six oxen or horses; elsewhere, by four.



Plow No. 77—Ruggles, Nourse & Co.

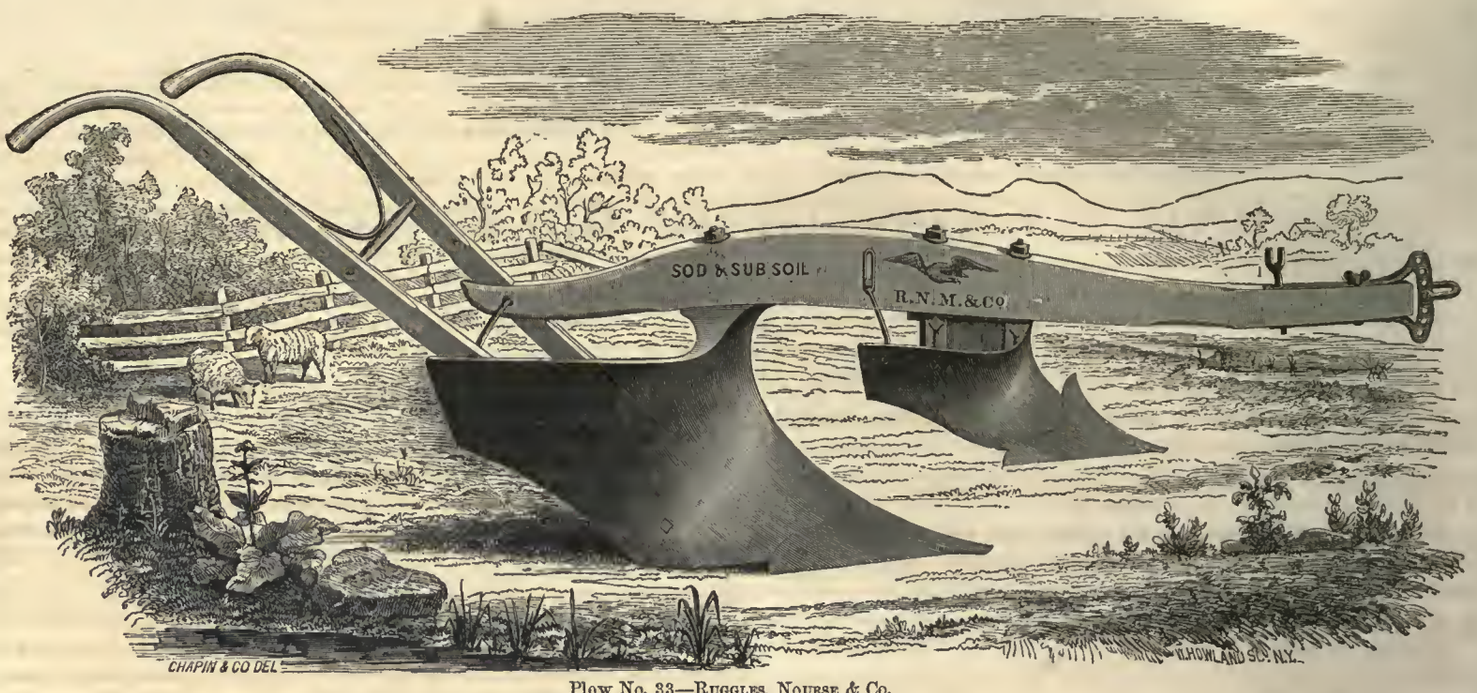
Plow No. 75 resembles the last; turns furrows 7 to 10 inches deep by 13 to 15 wide.

Plow No. 73½ is next in size; turns furrows 5 to 8 inches deep by 11 to 14 wide; adapted to flat and lapped plowing, by using an inclined cutter for the first, and a straight cutter for the latter mode.

Plow No. 72½, with long, narrow, convex mould-board, is adapted to stiff clay soils. Its furrows are 7 by 10 inches, and incline at an angle of 45°, presenting the greatest surface to the air, and the most soil to the harrow.

Plow No. 71½, designed for loose loams, turns furrows 5 to 8 inches deep by 11 to 13 wide, and lays the slices flat, with closely matched edges.

Plow No. 83, a hill-side plow, turns furrows 5 to 7 inches deep by 10 to 12 wide, inverting the slices with precision on levels or on hill-sides. The mould-board is easily revolved from one side the beam to the other, making a right or left-hand plow at pleasure. With this plow, the furrows may be all turned one way.



Plow No. 33—Ruggles, Nourse & Co.

Double Plow No. 33, for sod and subsoil plowing, is represented by the engraving. The forward mould-board is connected with the beam, and its depth of furrow is adjusted as follows: A substantial iron flange is fastened to the under side of the plow-beam, by two bolts passing up through the flange and the beam, and made tight on top by rivets and screws; the flange has two rows of slots to receive the bolts from the land-side of the forward plow, and the bolts make the plow entirely and substantially fast to the flange when the rivets are tightened; and by means of the slots in the flange the forward plow is raised or lowered, and made perfectly secure at any point wanted for the regulation of its depth of furrow. The forward mould-board turns the sod-furrow as wide as the working of the whole plow, and the earth on top assuming an arch-like shape, is naturally opened, while the effort of the rear mould-board brings up the deeper soil, completely covering and filling the surface, so that the sod-furrow is liable in no case to be brought to the surface by harrowing or other processes of after-cultivation. The surface of the furrow lies arching, the cohesion of the soil is neutralized, its integral parts are disunited, and the plowed land lies light and mellow, and almost as fine as if harrowed. Sod and Subsoil Plow No. 33 will work from 6 to 10 inches deep, the forward mould-board turning the sod to the depth of two, three, or four inches.

Steel Plow No. U. G. 3 corresponds in size and form with Plow No. 73½, already described. Its mould-board, land-side, and share, are made of steel, adapting it to the working of the rich sticky soils of the Western and other States.

Steel Plow No. X 4 is extra high in the standard, as it is specially designed for stubble or old land plowing. It has a short mould-board, is a thorough pulverizer, and a deep worker, carrying furrow-slices from 5 to 10 inches deep, and 10 to 14 inches wide, and will brightly polish, and work free and clear in all soils. It is of easy draught for two horses or cattle.

Plows Nos. 30, 31, 33, and 35, are of cast-iron, designed for plowing stubble or fallow lands. These sizes afford a range of work of from four to ten inches deep, turning under any amount of stubble, manure, or other vegetable matter.

The Reversable Subsoil Plow is a double-winged plow, with an inclined plane on each side, and is designed for loosening and pulverizing the lower soil, without bringing it to the surface. This plow is the invention of Professor Mapes.]

Expanding and reversable tooth cultivator.

Improved horse-hoe, with plow-shaped side teeth, which may be changed to turn the earth from or towards the rows.

Seed sowers, of various sizes.

Batchelder's Corn-planter, made to drop any number of grains, in hills from two to four feet apart, as desired.

Hay and straw cutters; vegetable cutter, with cast-iron wheel containing plane-iron cutters; corn-shellers.

Cylindrical butter-worker. A fluted roller, 18 inches long, and 6 inches in diameter at the larger end, works upon an inclined table. The buttermilk is drawn from the lower side of the table.

Machine for cutting meat and stuffing sausages; garden engine; horticultural tool-chest.

2. Hall & Speer, *Pittsburg, Pennsylvania.*—Inventors and Manufacturers.

1. The Patent Hill-side or Flat-land Swivel-beam and Double Mould-board Cast-iron Plow.

[The name of this plow indicates the novelty of its construction, and its adaptation to different circumstances. It may be used either as a right or left-hand plow; and, being double, with two shares, cutters, and mould-boards, it will enable farmers to commence plowing on one side of a field, and continue on the same side, turning the furrows all one way, without a single back or open furrow.]

2. The Patent Iron Centre-draught Two-horse Plow.

[This plow has also wrought-iron beam and handles, with cast-iron mould-board, land-side, and share. The peculiarity of this plow is in the termination of the rear end of the beam in a socket inside the mould-board, making the draught in the centre, exactly at the point of greatest resistance. The beam is adjustable to take more or less land, and to set the plow so that it may run to a greater or less depth. The handles also are adjustable to suit the different heights of the plowman or boy.]

3. The Patent Iron Centre-draught Plow for One Horse is constructed upon the same principles as the two-horse plow above described.

3. Rodermann & Roncè, *St. Louis, Missouri.*—Manufacturers.

Improved two-wheel plow.

[Calculated for broad and deep tillage, and arranged to perform its work with the greatest possible ease. It has a pair of wheels forward, to sustain the weight of the beam and facilitate the working. The wheels are separately adjustable, being independent of each other, so that they can both run on level ground or with one in a furrow. The draft-chain is arranged to govern in a great measure the depth of the furrow. The share is set very oblique, the mould-board of great turning capacity, and the land-side of such great length and surface, requiring so little power to guide the plow, that this is, with great propriety, called the "*Self-Holding Prairie Plow.*"]

4. Proseus, Peter F., *Volatie, New York.*—Inventor and Proprietor.

An improved plow.

[The peculiarity of this plow is an arrangement by which it is claimed that it will run with greater freedom and more nearly level than other plows. The improvement consists of a moveable roller underneath the mould-board.

It will plow a furrow from 5 to 11 inches in depth, and from 11 to 16 inches in width.]

5. Torey & Anderson, *Peoria, Illinois.*—Manufacturers.

Steel plows, with the share set at an acute angle, adapted to work easily in fibrous soils.

6. Miller, George C., *Cincinnati, Ohio.*—Manufacturer.

Steel mould-board plows.

7. Garrett & Cottman, *Cincinnati.*—Manufacturers.

Steel mould-board plows.

[Steel is by some considered a better material than cast-iron for the mould-boards, shares, and land-sides of plows designed to be used in the rich, sticky soils of the new lands of the Western States. Steel takes a higher polish and is less liable than cast-iron to be rusted by the vegetable acids of virgin lands.]

8. Minor, Horton & Co., *Peekskill, New York.*—Manufacturers.
Three plows of different sizes.

9. Criswell, Robert, *Brooklyn, New York.*—Inventor.
A double swivel plow.

[This plow is designed for the cultivation of corn, cotton, or potatoes, and is so constructed that it can plow two rows at once of any required width, and adjustable to throw the furrows either to or from the row, thus finishing it by once passing along, and by this feature accomplishing as much as two common plows.

It consists of a simple frame or cross-beam, with a tongue and two adjustable mould-boards. The frame can be adjusted to wide or narrow rows, the mould-boards to wide or narrow furrows, the depth of which is regulated by raising or lowering the tongue.]

10. Brownell, Franklin, *Niles, Michigan.*—Proprietor.
Baker's Patent Gang Plow and Seeder.

[This plow has been thoroughly tested in Michigan. It is constructed so as to use one or more plows, according to the nature of the work and the team, or to use any size or pattern of mould-board. The furrow slices are cut of the same depth and width, and the work is gauged by the wheels.

The seeder, which is attached to the body of the machine, is simply constructed, and can be taken off when not needed.]

11. Ramsay, William B. and George M., *Washington, Pennsylvania.*—Inventors and Proprietors.
Ramsay's Flexible Harrows, composed of three parts, united by three hinges or joints, so distributed upon a right-angled triangle as to give a full wide sweep and greater freedom and diversity of motion than can be obtained by twice the number of parts and hinges in any other arrangement or position.

12. Berlin, William, *Berryville, Virginia.*—Inventor and Manufacturer.
Improved, adjustable, double-iron-framed harrow.

[The advantages claimed for this harrow, over the common wooden-framed, are its greater durability. The double-frame acts as a trace to the teeth, always keeping their proper places and all of the same length; the teeth in the wooden harrows become loose, or bend, or fall out of their places, after having been in use for a while or exposed to the weather. The frame is adjustable by means of the upright screws, which can compress or widen it as may be necessary, when the teeth wear off or the situation of the soil may require it.]

13. Pratt, Ralph C., *Canandaigua, New York.*—Patentee and Manufacturer.
Pratt's Patent Ditching Machine, or Rotary Spade.

[This machine consists of a wheel with shovels on the outer circle, with frame-work forming a beam and casing hung on the shaft of the wheel, with a plow or mine to break up the earth, so that the shovels will each carry up their load through the casing and discharge the same by inclined slides on both sides of the ditch. The improvement combines the shovel and pick. When drawn along by two horses, at the rate of sixty feet per minute, it will discharge a shovelful per second, and cut from fifty to one hundred and fifty rods per day, according to soils and circumstances, the favorable or unfavorable condition of which affect the results the same as the use of the spade and pick. It is light of draught, simple in principle, and strong in structure, and when of the ordinary size requires only one man and a pair of horses to work it.]

14. Gibbs, Lucius H., *Washington City, D. C.*—Inventor and Patentee.
Gibbs' Rotary Spade.

[This implement consists of a combination of a hinged lever and spade, adapted to a rotary motion between two heavy iron circular plates. When in motion, the *lever-hinge* comes down upon the earth in front of the iron plates, or wheels, and acts upon the spade, which has previously entered the soil, and throws it out with its load as the weight of the machine rests upon the lever. The operation is repeated rapidly. The implement sustains itself, and does not require a holder.

This machine may be made to spade up the earth for any reasonable depth, say from six to fourteen inches, by adding to its weight; and to any required width. Its operation is to pulverize the soil and leave it loose at the bottom of the furrow or spading.]

15. Woodward, Joshua, *Haverhill, New Hampshire.*—Inventor.
Woodward's Seed Planter.

[It is constructed with a hopper to contain ashes, plaster, lime, or other fertilizers, for the kind of seed which is being planted, and a box to contain the seed.

The ground undergoes four processes of pulverization in the operation of planting:

1st. By means of a smoothing or surface-board in front of the planter.

2d. Through the action of the plow, in making the furrow for the seed.

3d. By the operation of the coverer.

4th. The broad-faced wheel crushes all the clods, and packs the seed with just the amount of pressure required.

This machine is capable of planting 8 acres per day with the ordinary labor of one man and a horse.]

16. Phillips, George, *Philadelphia, Pennsylvania.*—Inventor and Proprietor.
Corn, seed, and grain planter, hoe, harrow, and cultivating plow, combined in one.

17. Pennock, S. P. M., & Co., *Kennett Square, Pennsylvania.*—Patentees and Manufacturers.
Pennock's Improved Patent Seed and Grain Planter, adapted to planting wheat, rye, oats, barley, rice, clover and timothy seeds, &c.

18. Wright, John S., *Chicago, Illinois.*—Manufacturer.
Atkins' Automaton or Self-raking Reaper and Mower.

[Capable of reaping all kinds of small grain and delivering it in bundles ready to bind; and also, after removing some parts of the machine, of mowing the various kinds of grasses, clover, &c., leaving the grass spread evenly to cure. The knife is furnished with a serrated or sickle edge on the back to prevent clogging or choking in cutting grass or wet grain. The raker is intended to be attached to any of the ordinary reapers, by means of a bevel-wheel, 23 inches in diameter, upon a spur of which, on the inside of the rim, is a knot working into the hollow end of an arm; and, by the turning of the wheel, the arm, in its circular motion, creates a motion of the rake, which is exactly what the motion of a man's hands would be, in stooping down and gathering up the grain cut by the reaper and laid upon the platform. The rake then turns round, opens its fingers, lays down the wheat ready for the binder, and then repeats the series of actions just enumerated.]

19. Hussey, Obed, *Baltimore, Maryland.*—Inventor and Proprietor.
Reaping and mowing machine.

[The peculiarity of Hussey's machine is in the cutting apparatus, wherein the straw is held both above and below the edge of the blades while being cut. The main driving-wheel, with its axle running in a frame-work, rolls on the ground and follows in the track of the horses on the stubble. Attached to this frame is a platform extending to one side from five to seven feet in a horizontal position, and near the ground. On the front edge of this platform is the cutting apparatus. This consists of a row of strong iron points or guards, each having a horizontal slat through which lancet-shaped blades, attached to a rod, are made to vibrate by means of a crank at the end of the rod connected to the driving-wheel by cog gearing. The rapid motion of the blades through the slats in the guards cuts the grain as it enters between them; as fast as it is cut it falls upon the platform, whence it is easily removed by a man who rides at the rear of the machine. It is converted into a mower by simply removing the platform, retaining only the bar to which cutters are fixed. This allows the grass to fall over the bar evenly spread. The superiority of the execution of the reaper over hand labor is acknowledged, and the saving in the grain is estimated at from one to two bushels per acre. The saving in labor is the important consideration, and is fully equal to five or six men. Hussey's machine was invented in 1833, and a patent issued the same year. In 1847 a subsequent patent was granted for an improvement in the points or guards by which the choking matter found a ready escape at the upper side of the knife, while the edges of the blades chaffened it out on the lower side.]

20. McCormick, Cyrus H., *Chicago, Illinois.*—Inventor and Proprietor.
The Virginia Reaper.

[This reaping machine was originally patented in 1834, though it is in evidence that it was tested in the field in the harvest of 1831. More recent patents have been granted to the inventor for improvements. It cuts with knives of a peculiar form, being broad at the base, short in length, and having a sickle edge, working between spear-shaped teeth or fingers. It has a reel for bending down the grain, which is raked from the platform by a man riding behind the driver. The distinctive feature is the sickle edge: this is believed to constitute the essentiality of the patent in Great Britain. The arrangement for carrying the raker upon reaping machines having a reel is a patented improvement of 1847. The method of supporting the cutting apparatus by an iron beam, and other minor improvements over the original machine, make it an effective implement for the combined purposes of reaping and mowing.]

21. Manny, John H., *Freeport, Illinois.*—Inventor and Manufacturer.
Manny's Patent Adjustable and Combined Reaper and Mower.

[This machine is adapted to the harvesting of all kinds of grains and grasses. Its triangular frame is so nearly balanced on the wheels that the cutters are rendered easily adjustable to the surface and the grain by means of a simple lever convenient to the driver. The construction of the platform and rakers greatly facilitates the discharge of the grain in an oblique line from the cutters, and sufficiently far from the standing grain for the next circuit of the team. The cutting apparatus is a series of lozenge-shaped blades with their rear points extending back of the bar to which they are rivetted, for the purpose of cutting off and clearing out all clogging substances that gather into the finger-guards. The machine is converted from a reaper into a mower by simply removing the easily adjusted platform on which the grain falls.]

22. Burrall, Thomas D., *Geneva, Ontario County, New York.*—Inventor and manufacturer.
Burrall's Convertible Reaper for Grass or Grain.

[This machine is made to discharge the grain in the rear or at the side, and is convertible into a grass-cutter by removing the apron from the power frame, attaching a finger-board and cutter-bar, and adding a gauge-wheel in front.]

23. Foardsh, E. B., *Buffalo, New York.*—Patentee and Manufacturer.
Improved mowing and reaping machine.

[The clamp can be raised and lowered on a perpendicular line, and sustain the finger-bar at any height required, on a line with the axis of the driving wheel. The guard finger has an outside and an inside bar for the cutting tooth to cut against. The outside bar presents an angular, and the inside bar a straight surface. The cutting is principally done against the outside brace bar, consequently the grass or grain is cut on two angles, and a more gradual, even, and easy cut is obtained. When the guards are arranged on the finger-bar, they mutually brace and support each other. One span of horses only is required to propel the machine, and to cut ten or fifteen acres in a day.]

24. Seymour & Morgan, *Brookport, New York.*—Patentees and Manufacturers.
New York Reaper.

[The machine, as exhibited at the Palace, has the common serrated or sickle-edged knife, working between guiding fingers, the standing grain being pressed up to the knife by a reel. The cutting edge of the reaper is set about two feet from the gearing and in a line with the centre of the driving wheel.

The raker rides at the back of the platform, pushing the grain off with a fork behind the horses, so that it is left in bundles out of the way of the next course.]

25. Gregg & Denton, *Peoria, Illinois.*—Proprietors.
Denton's Self-Raking Reapers.

[In this machine two endless aprons carry the cut grain and deposit it in the hopper, which receives and straightens the grain, and drops the same gently on the ground ready for the binder.

The sickle or knife is nine feet long, two and a half more than most others. It vibrates one foot, thus reducing the speed which it is necessary to give to a shorter vibration, and requiring less power and wear of machinery; also, by passing through a number of guards or fingers, it is not liable to clog in wet grain. It can be worked by two horses, with a single person to attend it.]

26. Howard & Co., *Buffalo, New York.*—Manufacturers.
Ketchum's Improved Mowing Machine.

[The shafts have bearings at both ends, which overcome all cramping and cutting down of boxing.

A counterbalance is attached to the crank-shaft, which gives the crank a steady and uniform motion. The machine is guaranteed to be capable of cutting and spreading, with the aid of one span of horses and a driver, from ten to fifteen acres per day of any kind of grass, either heavy or light, wet or dry, lodged or standing, and to do it as well as is done by the best mowers with a scythe.]

27. Elliott, Augustus, *San Francisco, California.*—Inventor and Proprietor.
The Golden Harvester, a self-bundling reaper and mowing machine combined.

[The uses of this machine are to cut the grain, pass it through a process of bundling, and, while compressed, deliver it ready to be bound before leaving the machine; it may also be used as a mower, when divested of the bundling apparatus. It is the only machine hinged in the centre (from the cutter-bar backwards) to overcome uneven surfaces. It has two driving wheels geared into opposite sides of the crank-shaft, is pushed before the team, and is guided by a man who operates the steering wheel which is behind the team. The crank-shaft forms the centre of the machine, has a double right-angled crank, which operates a cutter-box each way from the centre, by revolving in two perpendicular slots (believed by the inventor to be a new mechanical device) in place of the common connecting rods. The cranks, being at right angles with each other, cause one bar to cut while the other is at rest. The centres of the cutters are indented to the thickness of the tooth plate, to prevent clogging, and still preserve their original strength. The fingers curve downward, which tends to raise lodged grain or grass as they pass back to the cutter-bar. This machine adapts itself to uneven surfaces in two ways, being attached by a hinge (at the end of the pole or tongue) and aided by a lever above. It avoids all side draft, and cuts its own road before the team, unlike other machines. Power is gained in the arrangement of the knives, and the bundling apparatus is so arranged that the grain can be bound upon the machine at a saving of labor equal to two-thirds over the old method of binding after the machine.

28. Nesen, Joseph E., *Buffalo, New York.*—Inventor and Proprietor.
Nesen's Patent Reaper and Self-bundling Machine.

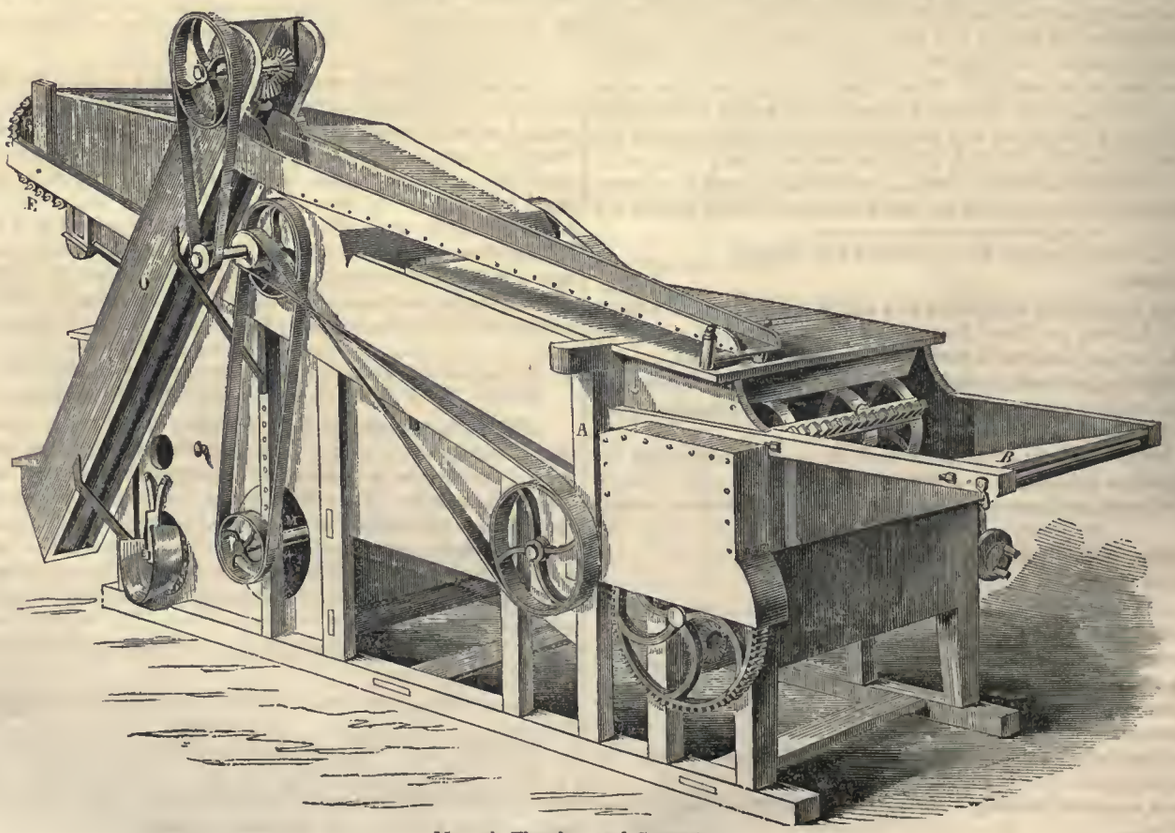
29. Fitzgerald, Daniel, *New York.*—Inventor and Proprietor.
Reaping and mowing machine.

[This machine is constructed with two cylinders mounted vertically upon a pair of wheels, and geared so as to revolve toward each other. On the bottom of each cylinder a set of knives, like short scythe blades, are set, and out of the surface of the cylinder fingers, like cradle fingers, which carry the grain, as it is cut by the knives, between the two cylinders, where it is received in an upright manner by the binders, who stand upon a platform in the rear. The knives and fingers are made to withdraw into the cylinders, by a very ingenious arrangement, as they approach each other.]

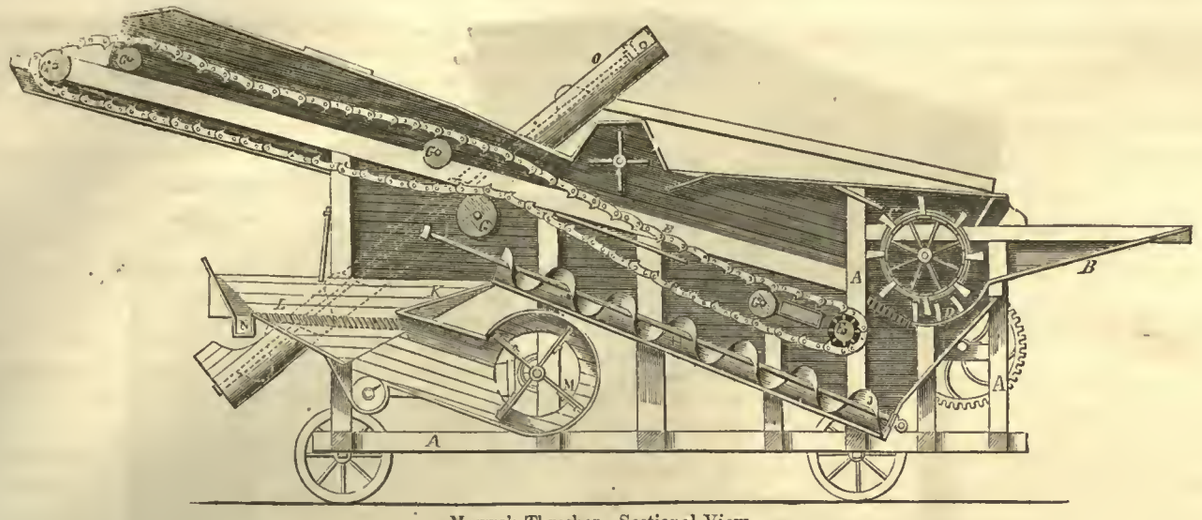
30. Wagener, Jeptha A., *Poultney, New York.*—Inventor and Patentee.
Clover and timothy-seed harvester.

[The harvester consists of a simple frame and box, mounted on wheels, in front of which is a cylinder set with spiral knives, acting in concert with curved spring teeth, in combination with a straight knife, which forms a perfect shear, and thus severs the heads from the stalks, which are at the same time discharged into the box. The teeth being made to spring and vibrate, not a stalk of clover can escape being cut, or allow the teeth to become clogged. The cylinder and knives are protected by an adjustable guard-plate, thus allowing only the heads to pass to the knives, retaining the head, and the head only, thus leaving the stalk to the soil. The machine can be adjusted to the height of the clover and timothy. This is accomplished by a simple lever at the side. With the aid of one horse and a boy it will harvest twelve acres per day.

31. Moffit, John R., *Piqua, Ohio.*—Inventor and Patentee.
Improved threshing and separating machine.



Moffit's Thresher and Separator.



Moffit's Thresher—Sectional View.

[The straw carrier is made of round wooden slats, connected with cast-iron links, and driven by a cog-wheel. The riddle does not allow the straw to lodge in it. At the end of the riddle there is a tail-board and spout, to catch all the unthreshed heads, which are conveyed by a screw back to the cylinder, to pass again through the machine. A rolling screen, when necessary, separates the chess and cockle from the grain.]

32. Snyder, Elisha S., *Charlestown, Jefferson Co., Virginia.*—Inventor and Proprietor.

The Farmers' Labor Saving Machine, for threshing, separating, cleaning and bagging grain.

[The operation of threshing, separating, cleaning and bagging the grain, by this machine, are perfect in their united action; or they may be operated separately, i. e., the thresher alone, or the separator and cleaner by itself. The machine on exhibition requires but two horse power, and will thresh one hundred bushels per day, cleaning it perfectly and carrying it to the bags. A revolving fender prevents any waste by throwing out the grain, the revolutions of the fender preventing the choking of the machine and assisting to continually remove the straw from the cylinder and separator as fast as it is threshed. Slender stationary rods or fingers facilitate the progress of the straw and prevent the riddles from choking. The grain is cleaned by a double fan, blowing in two directions.]

33. Palmer, William R., *North Carolina.*—Inventor and Proprietor.

Rotary seed and grain thresher, capable of threshing every kind of seed and grain, except maize.

[This is effected by the cast-iron rubbers on the inside of the flail-case, which have furrowed surfaces, and may be fixed at any required distance from the track of the rotaries. The amount of seed threshed depends on the length of the straw, &c. The grain is also cleaned from smut, &c.]

Palmer's Improved Spike-Thresher, in which the construction of the feed-board and cylinder is changed, and a protective roller added, as a safeguard against the dangerous accidents that were constantly occurring in the common spike-thresher, and caused its use to be prohibited in England by law.

A horse-power so constructed that a leverage of 12 to 25 feet may be obtained, and several hands worked at the same time. Different velocities are given by conical pullies on the large wheel of the horse-power.

34. Hathaway, B. G. H., *Rock Stream, Yates Co., N. Y.*—Inventor and Patentee.

Patent huller and cleaner, combining the essential improvements of threshing machines with the power to hull and clean clover-seed.

35. Glaze, Joseph, *Frederick City, Maryland.*—Proprietor.

Feaga's Grain Cleaner, patented by G. & G. W. Feaga, in 1853.

[This machine cleans wheat by a current of water; and after washing is complete, the grain falls into dryers, and passes out ready for grinding.]

36. Zimmerman, G. F. S., *Charlestown, Virginia.*—Patentee.

Machine for threshing, separating, cleaning twice, screening, and bagging all kinds of small grain at a single operation; capable of turning out ready for the mill from 300 to 500 bushels of wheat a day, with six or eight horses, or from 800 to 1,000 bushels, if twelve horses and as many hands are employed. The machine is simple, having but one fan and shoe for the operation of cleaning and bagging.

37. Gilbert, Joseph G., *New York.*—Patentee and Proprietor.

Thresher and cleaner, adapted for threshing and cleaning grain by one operation.

[The skeleton cylinder is formed of wrought-iron bars, 2½ inches wide, ¼ of an inch thick, and 15 inches long, each with a hole punched through its centre for the shaft; four pieces of iron, each 4 inches in length, are riveted to each end of the bars, presenting the appearance of a five-tined fork, the prongs being about half an inch apart. These bars are rounded, their ends describing a circle, the diameter of which is represented by the length of the bars. The main bars are keyed upon the shaft and bolted to each other, so that when completed the points are equally distant from each other. This form of beater, when revolving over bars of iron, set diagonally in the concave, combs and beats the grain from the straw effectually, and it is maintained with less liability to break the grain or straw than in ordinary threshers.]

38. Mansfield, Martin H., *Ashland, Ohio.*—Patentee and Proprietor.

Mansfield's Patent Clover Hulling and Cleaning Machine.

[This machine, as its name indicates, is used for hulling and cleaning clover-seed. It is calculated to prepare, ready for market, in a perfect manner, from three to ten bushels per hour, with a power of from three to six horses.

The hulling part is a cylinder 22 inches in length, to which is attached 90 teeth, or rubbers, in parallel rows, similar to the drum of a threshing machine. The concave has 143 of these teeth, or rubbers, also in parallel rows. These rubbers are made of the best malleable iron, and project from the surface of the cylinder and concave one inch and a quarter each, being one inch and a half in width. Their sides are neatly fluted, and taper to a sharp edge in front, the backs being broad and roughened, and they are placed in the concave and upon the cylinder in such a position that the front edges of the revolving rubbers on the cylinder will pass between the front edges of the rubbers in the concave—the clover-seed being pulled by the diminishing of the space from the front edges of the rubbers to the corners of their backs, as they pass each other by the revolution of the cylinder, or by the oblique sides of the rotating rubbers passing between the oblique sides of the stationary rubbers.

The feed-board is so arranged that stones, sticks, &c., are thrown out. It is a self-feeder, with an endless apron.]

39. Childs, Augustus B., *Rochester, New York.*—Inventor.

Patent grain separator and winnower, for cleaning all kinds of grains and seeds.

[This machine combines the principles known as blast, screen, and suction; and, according to size, cleans from 50 to 200 bushels an hour. The grain is first received on a coarse screen, which removes all impurities larger than itself; it then falls upon a vibrating board, and is played upon by a blast of air from the fan; the grain next passes to the chess-and-cockle screen, and thence into an upright suction pipe, in which all remaining impurities are removed by an upward blast of air, and deposited in the air-chamber.]

40. Elmore, J. N. & D., *Elmira, New York.*—Manufacturers.

Booth's Grain Separator; to separate pure and perfect grain of every kind from all impurities, and from shrunken and imperfect kernels, delivering the latter in good condition for feed. [It is an application of specific gravity.]

41. Salmon, George B., *Elgin, Illinois.*—Inventor and Proprietor.

Salmon's Improved Grain and Grass-seed Separator.

[This machine will separate impurities from wheat, clean seeds of every kind, and separate any two varieties, where there is a material difference, either in size or weight.

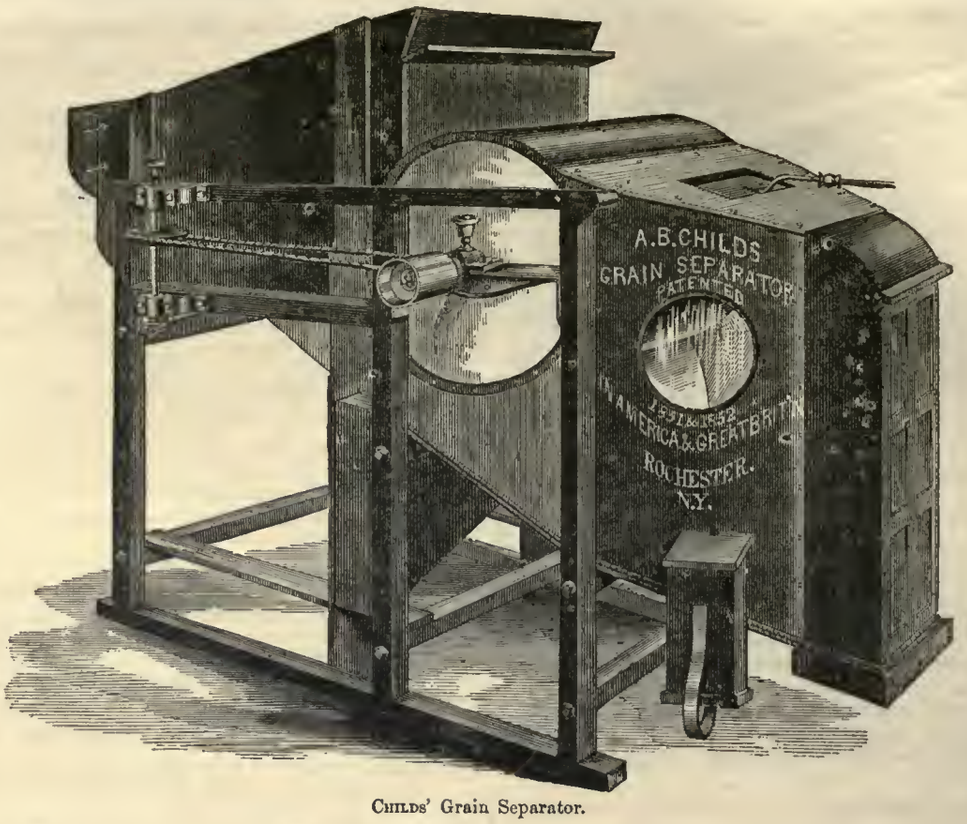
The fan is made of iron, 18 inches in length and 16 inches in diameter, and is placed in an air-tight trunk at the bottom of the frame, two feet wide by three feet long, and four feet high. The fan is driven by a cog-wheel two feet in diameter, which gives it great velocity, sending the air up a tight trunk, through which the grain is falling from the sieve, the dust escaping with the air at its head, which is partly covered by a wire sieve, while the screenings immediately fall through the mouth of the head of the trunk, free from dust and dirt, the good grain falling through the blast into a receiver at the bottom.

The sieves are so arranged that the heavy seeds, such as cockle, red-root, and yellow-seeds, are taken out without the aid of the blast. There are from two to six sieves used for different seeds, but only one at a time; these are shaken in front by a cam and spring, instead of a side motion.]

42. Coates, William Bailey, *Washington City, D. C.*—Inventor and Proprietor.

Patent hemp and corn cutting machine.

[It consists of a strong frame, resting upon four wheels, with a slowly-revolving



CHILDS' Grain Separator.

grasper, to bend down the hemp or corn between the teeth for the cutters. A strong elbow, extending about five feet to the left of the body, and running back to the hind axletree, contains all the simple machinery, which has never to be adjusted while working.

The elbow can be placed at the elevation necessary to cut the crops at a proper height. The teeth are adjustable to suit the width of the rows of corn; two in number are used in harvesting this crop, while more are added when it is arranged for hemp. These teeth are curved to the right and left, and oblique from the top and right edge to the lower and left side.

The corn enters between the curves, and two rows can be cut at once. The choppers work on a rock-shaft, which has a combined lateral and semi-rotary motion; this throws the choppers against the right edges of the teeth, and a little below them cutting the stalk at an angle of forty-five degrees. A light frame-work, with a spring-bottom, is secured to the transverse pieces on the left of the main frame. The graspers having drawn the stalks downwards and forwards, and held them between the curved teeth, or arms, while the choppers were cutting them, the severed portions fall backward upon the spring-bottom of the frame. The driver pushes back a lever attached to the spring, which lets the corn or hemp fall to the ground in gavels at proper intervals. The machine will require two horses when arranged for cutting corn, and four for cutting hemp.]

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43. REAM, JACOB L., *Pulaski, Illinois.*—Inventor and Proprietor.
Maize, or Indian Corn Harvester.

[It consists of broad knives, fastened obliquely to the lower edge of an axle on either side of the thills, and just within the wheels. These knives are adapted to the rows of corn, of which they are calculated to cut two at a time, the horse walking between them, while the wheels run outside. The stalks fall back upon a frame-work projecting from the axle in the rear, and are retained until enough has accumulated for a bundle, when, by pulling a spring, they are dropped upon the ground. There is a reel above the axle, which bends the stalks down to the knives, and the cutting is effected by simply drawing the blades against them.

This arrangement might easily be adapted to an ordinary set of wheels.]

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44. SEELY, ORAN W., *Albany, New York.*—Patentee.
Straw cutter, patented in July, 1853.

[It has the general features of a machine for the same purpose, patented by J. T. Rich several years since. The cutter box, feeding apparatus, and the movement of the knife, are the same. The knife is shaped like an inverted w (M), and is secured in a stiff metal frame, so arranged as to leave space enough between the edge of the knife and lower frame, or bar, to permit the feed to be cut to pass freely through. To the lower frame, or bar, is attached a rod, connecting it with a lever underneath the box, from which it receives its motion. The patentee of this machine claims the arrangement of the metallic guide in combination with the knife frame, and the knife, formed as above specified, with the frame, against whose front edge the knife is designed to play, which is adjusted to its place by springs and screws contained in hollow boxes.]

45. MOORE, JOHN, *New York.*—Manufacturer.
Patent self-sharpening straw cutters.

[There is a single stationary knife, placed across the mouth of the machine, with its edge toward the cutting box, having both sides beveled; two cylinders, with spiral square-edged blades, placed above and below the horizontal knife, and revolving toward each other against its edge. The action is similar to that of a pair of shears, the hay or straw passing out both above and below the knife, which the spiral blades serve to keep continually sharpened.]

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46. TAYLOR, THOMAS, & Co., *New York.*—Inventors and Manufacturers.
Excelsior Straw, Hay, and Corn-stalk Cutter.

[The cutting is done by circular knives, of which any required number are put upon a shaft, at a distance of ⅜ to 1 inch apart. A wooden cylinder is placed with its axis parallel to that of the knife-shaft, and at such a distance that the knives may touch it. This cylinder and the knives are made to revolve towards each other, and the straw, &c. being placed on either the knives or the cylinder, is drawn in and cut between them; thus, a bundle of straw being thrown into the machine, is at once cut into as many lengths as there are knives.]

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47. KUNCKEL, A. S., *Marietta, Ohio.*—Proprietor.
Parker's Patent Straw Cutter.

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48. ROSE, IRA B., *Hancock, New York.*—Proprietor.
Wingo's Patent Straw and Corn-stalk Cutter, represented by a small model.

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49. READING, WILLIAM, *Flemington, New Jersey.*—Inventor.
Patent power corn sheller, capable of shelling from 75 to 200 bushels an hour, and discharging the corn and cobs separately.
Stover's Corn-kiln, represented by a model.

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50. BACKUS & BARSTOW, *Norwich, Connecticut.*—Manufacturers.
Corn shellers and straw cutters.

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51. ROBINSON, EBENEZER, *Greencastle, Pennsylvania.*—Proprietor.
Mumma's Corn Sheller and Grinder, used for shelling corn and grinding roots, &c., into a pulp.

[The shelling apparatus consists of a horizontal concave cylinder, 17 inches in length, 11 inches in diameter at the ends, and about 8 inches in diameter in the centre, armed with spiral rows of teeth. Immediately in front, and as near the cylinder as possible, is placed a steeply-inclined breast-beam, on which the cobs pass freely and rapidly out at the side of the machine, separated from the corn. Over the breast-beam, in front of the cylinder, are suspended two wooden springs, faced with thick plates of cast iron, which hold the ears against the cylinder until they are shelled and pass off. The springs are adjusted at pleasure, by means of thumb-screws, according to the dampness or dryness of the corn. It is propelled by hand, (one crank or two,) or by horse, water, or steam power, at pleasure. When used for grinding, the

aprings and breast-beam are taken out (which is readily done by removing four screws) and a simple slide inserted, cut on its lower edge to fit the shape of the cylinder, with small spikes driven into that part of it which play freely between the rows of teeth on the cylinder, and serve to keep it clean, also to assist in grinding.]

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52. Sharp, Theodore, *Chatham Four Corners, New York.*—Inventor and Manufacturer.
Improved endless chain horse-power.

[The chain is made of crooked or curved links, with cogs on their outer edge, and supported on their inner or under edge, at each extremity, by drums of twelve inches in diameter that revolve with the chain, which constitutes a regular gear-wheel of 16 inches diameter, working into pinions on the driving shaft. This shaft transfers sufficient motion for threshing or any other use to which horse-powers are applied, and without the necessity of using extra shaftings to procure the necessary speed.]

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53. Jerome, E. J. & M., *Hempstead Branch, L. I., New York.*—Manufacturers.
Jerome's Improved Belt-Geared, Endless Chain, Railway Horse-Power.

[In this machine belt gearing is substituted for cogs, and are arranged so that one draws against and tightens the other, combined with a movable shaft, allowing the belt to be tightened with a thumb-screw.]

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54. Crofut, Charles, *Bridgeport, Conn.*—Manufacturer.
Portable grain mills, worked by hand or horse-power; made with the best French burr stones.

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55. Owens, James D., *Pittsburg, Pennsylvania.*—Proprietor.
The Farmer's Portable Mill.

[This mill is but three feet high, nineteen inches square, and weighs 235 lbs. The burrs are 15 inches in dinmeter by 11 in depth, made of hard-wood with iron bands, and faced with wrought-iron plates, one inch wide by ⅛ inch thick, screwed on in a radiated manner from the centre, leaving intermediate spaces of one inch. These spaces are filled up by driving in wrought-iron spikes without heads, until space is filled, and thus presents a burr-face as solid as if cast, and more durable; and being thus constructed, it contains the double principle of a French burr and a cutting file or rasp, consequently presents a grinding surface far superior to any casting, and in some respects to the burr-stone, obviously requiring less power to do the same work. Unlike the burr-stone or casting, it does not heat; the spike part does not require dressing, only the plates, and these can be dressed with a cold chisel.]

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56. Deering & Dederick, *Albany, New York.*—Manufacturers.
Dederick's Patent Parallel Lever and Horizontal Hay Press, for packing hay or any loose materials.

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57. Snyder, George, *Rhinebeck, New York.*—Manufacturer.
Toggle-joint Perpendicular Lever Press.

[This press is intended for baling hay, cotton, tobacco, &c.]

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58. Filson, John, *Milroy, Pennsylvania.*—Inventor.
Self-Adjusting Farm Gate, furnished with a spring operated by a lever, so as to be readily opened by a person on horseback without dismounting. The lower hinge swings the gate open, and allows the front to be lifted up, while the upper hinge is combined with a cogged wheel, working in a ratchet, so as to sustain the front.

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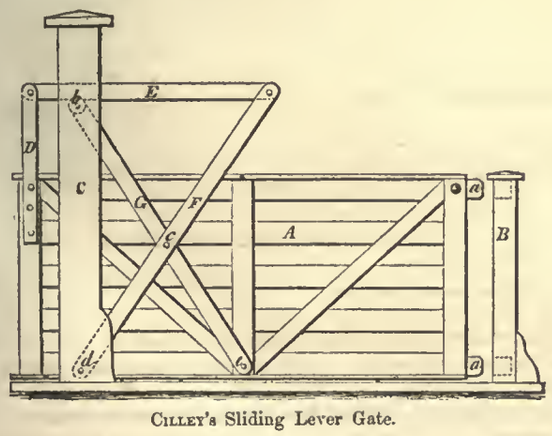
59. Cilley, Nathaniel W., *Nottingham, New Hampshire.*—Inventor.
A half-size model of a sliding lever farm gate.



Cilley's Sliding Lever Gate.

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60. Massachusetts Shovel Company, (S. Balcom, Agent,) *Worcester, Massachusetts.*—Manufacturers.

Kimball's Patent Shovel. The "D" is made of malleable iron, except the hand-piece, and is connected with the shaft of the handle by a socket into which the shaft, after being compressed, is forced by machinery. The shaft is fastened to the blade by a malleable socket riveted fast. The blade is cut out of plates of the best cast-steel, and after heating, receives the proper form in a drop-press. The implement is finished by riveting and polishing.

61. Ames, Oliver, & Sons, *North Easton, Massachusetts.*—Manufacturers.

Shovels and spades with plain backs. The steel of the blades is welded between two pieces of iron, and being tempered, the soft iron wears away and makes the shovel a self-sharpening implement.

[Messrs. Ames founded their establishment in 1801; they employ 300 men, produce 2,400 shovels and spades daily, and consume each year 1000 tons Swedes and Russia iron, and 450 tons English cast-steel.]

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62. Bussino, J. S. & Co., *New York.* (Agents for Old Colony Iron Company, *Taunton, Massachusetts.*)
Highly finished shovels and spades.

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63. Pierce & Wood, *Middleborough, Massachusetts.*—Manufacturers.
Shovels and spades, long and short handled, made after the patterns and with the machinery of O. Ames & Sons.

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64. Duryea & Rhodes, *New York.*—Manufacturers.
Highly finished shovels and spades.

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65. Bolles, Lemuel & Co., *Oxford, New York.*—Manufacturers.
Solid shank cast-steel hoes, formed from one solid piece of steel, with solid shanks, without welding.
Iron and steel-plated hoes of the same shape and form, being manufactured in the same manner, with the steel welded and plated upon the iron.

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66. The American Hoe Company, *Winsted, Connecticut.*—Manufacturers.
American Planters' Cast-steel Hoes.

[These hoes are strong, heavy, highly finished and well made. They are specially adapted for Southern culture.]

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67. Homers & Ladd, *Boston, Massachusetts.*—Manufacturers.
Patent Cast-steel Concave Hoes, with iron shanks welded to the blades.

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68. Partridge, Henry, *Medfield, Massachusetts.*—Manufacturer.
Manure forks and potato rakes.

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69. Tuttle Manufacturing Company, *Naugatuck, Connecticut.*—Manufacturers.
Hoes, garden tools, potato rakes, hay and manure forks, &c.

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70. North & Denio, *Fly Creek, New York.*—Manufacturers.
Hay and manure forks, made of cast-steel, with Swedish iron shanks, keyed into the handles.

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71. Lyman, A. C., *Williamsburg, Massachusetts.*—Manufacturer.
Garden rakes and hoes.

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72. Rugg, Amos, *Montague, Massachusetts.*—Manufacturer.
Improved bent hay rakes.

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73. Stedman William, *Tyringham, Massachusetts.*—Manufacturer.
Hand hay rakes, made with white-ash handles and heads, having hickory bows and teeth, and are very light though strong.

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74. Broga & Childs, *West Becket, Massachusetts.*—Manufacturers.
Hay Rakes, with white-ash heads and teeth, bows and handles of seasoned hickory.

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75. Millard, David J., *Clayville, New York.*—Manufacturer.
Grain, grass, bramble, and lawn scythes.
Hay knives.
Hay, straw, and manure forks.

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76. Mansfield & Lamb, *Smithfield, Rhode Island.*—Manufacturers.
Scythes and patent snaths.

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78. Smith & Fenwick, *New York.*—Inventors.
Patent machine for paring, coring, and quartering apples.

[The apple and the fork have two revolving motions, one on a semicircular horizontal rack, and one vertical on a small pinion attached to the revolving fork. The motion feeds the apple from its stem to the blossom end, while the little pinion causes it to be brought rigidly against the yielding spring knife, which pares it perfectly.]

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79. Palmer, Thomas, *Camden, New Jersey.*
Hardwick's Patent Machine for Paring, Coring, and Cutting Fruit.

[This machine pares, cores, and slices the fruit, and separates each part to itself. The apple is placed upon a cutting, tubular fork, which cuts the core free, while it effectually retains the fruit during the process of paring.

The knife is applied to the apple with one hand, while the other turns the crank on the shaft; then the knife is permitted to fall and a lever is brought against the fruit, which is forced against the cutters, and falling down is conveyed by a spout below to its proper place; the core is in transit through the hollow shaft, and the next apple pushes out of an opening near its extremity. It is not necessary to touch the fruit after it is placed upon the machine until it comes out pared, cored, and sliced.]

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80. Carter, Charles, *New York.*—Inventor.
Patent Apple and Peach Parer and Discharger.

81. Phelps, E. W., & Co., *Westfield, Massachusetts.*—Proprietors.

Phelps' Combination Bee-Hive. Its size may be adapted to a large or small colony of bees, allows the removal of surplus honey or old comb without disturbing the bees, and also permits the operations of the hive to be seen.

82. Dennis, John, & Co., *Boston, Mass.*—Inventor.

Improved Bee-Hive; containing feeding-chamber, moth-trap, and removable boxes for honey.

83. Davis, Sylvester, *Claremont, New Hampshire.*—Inventor.

Patent Platform Bee-Hive; guarded against bee-moths and robbery from other hives, and furnished with apparatus to prevent swarming.

84. Dick, David, *Meadville, Pennsylvania.*—Patentee.

Anti-Friction Cheese Press; constructed of iron on the principle of Dick's Patent Punches and Shears.

85. Tyler & McKenney, *Clarksfield, Ohio.*—Inventor.

Patent Excentric Lever Press; applicable to a variety of uses.

86. Williams & Hackley, *Bellville, New York.*—Manufacturers.

Hackley's Improved Cheese Press; one screw is operated by a crank, and exerts a power of 1200 lbs., which, by a lever, may be increased as required.

87. Tillinghast, Joseph B., *Point Harmar, Washington County, Ohio.*—Inventor.

Patent Centrifugal Churn.

[It has an ordinary upright shaft, with spokes, revolved by a crank at the top of the churn, which, put in motion, sets the cream into a horizontal whirl. Three cleats on the inner surface, fastened in a spiral direction, each beveled on the upper side, break the eddy and produce a thorough agitation; by turning the other way the bevel tends to quiet the agitation and collect the butter separated by the former process.]

88. Blanchard, Geo. A., *Concord, New Hampshire.*

Davis' Patent Self-Adjusting Churn; the cream is agitated by stationary and movable floats, and the butter, being separated, is collected by a few half-revolutions of the crank. The butter is worked by reversing the movement of the crank, the dasher being closed up by the movable float. Salting is effected by the same means.

89. Crowell, William A., *Lime Rock, Connecticut.*—Patentee and Manufacturer.

Crowell's Thermometer Churn; so constructed that the cream is brought to the desired temperature without mixing with water, and the temperature determined by a thermometer at one end.

This is effected by a double bottom, made in the form of a semicircle, of two sheets of metal, placed one above the other, at a sufficient distance apart to admit cold or warm water, as may be required.

90. Francisco, Samuel P., *Reading, Pennsylvania.*—Inventor.

Atmospheric Churn.

[A square tin churn, placed in a wooden box, with a revolving dasher near the bottom, consisting of a disk, surmounted by a tubular stem, extending through the top of the tub and open at its upper end. This disk has nearly the same diameter as the tub, and is perforated with radial tubular channels, communicating with the interior of the stem; when the dasher is in operation the air passes down the stem through the lower part of the dasher into the cream. The sides of the dasher project into the cream, and when it is rotated rapidly, a partial vacuum is formed in the cream, behind the projecting sides of the dasher, into which the air rushes and mingles with the cream. The dasher is mounted on a spindle, passing through and projecting below the bottom of the tub, and turning in a water-tight bearing; to this the motion is conveyed by means of a pinion and bevel-wheel, driven by the crank-shaft. The rapid motion of the dasher, effecting a free introduction of air into the cream, produces a gentle but thorough agitation, which the smooth surfaces of the dasher and tub would not of themselves do. The time of producing the butter is a tenth or an eighth of that required by the ordinary mode.

The butter is gathered by reducing the speed of the dasher, when the small particles cohere and form into large rolls or balls.]

91. Hyam, Abraham, *Baltimore, Maryland.*—Inventor.

Atmospheric Churn; simple in its construction, being the ordinary dasher-churn, with an apparatus attached for forcing air into the mass of the cream.

92. Smith, Miss L. A., *Windy Bush, Bucks County, Pennsylvania.*—Inventor.

Labor-Saving Butter-Worker.

93. O'Neill, John, *Xenia, Ohio.*—Inventor.

Atmospheric Lever Churn.

[The box of the churn is divided in the centre by an upright diaphragm, pierced lengthwise with tubes, open to the air above, and with a scalloped cut at the immersed end. When the dasher—of which there is one part on each side the partition—works, air passes down through the tubes and aids in agitating the cream.]

94. Allen, Richard L., *New York.*—Manufacturer and Agent.

Collection of agricultural, horticultural, and dairy implements and machines.

1. Plows of 60 patterns, for various kinds of soil and tillage.
2. Harrows—double, Scotch, square, and triangular, adapted to all kinds of land.
3. Cultivators for corn, potatoe, tobacco, coffee, and sugar-cane crops.
4. Seed drills, for hand or horse-power.
5. Cast-iron garden roller, made in two sections.
6. Bush and root pullers, with two and four claws, for extracting roots, &c., by horse-power.
7. Post-hole augers, for boring holes for posts from 6 to 12 inches in diameter.
8. Threshing machines, of various sizes.
9. Fanning mills.
10. Corn-shellers, with single or double hoppers.
11. Cylinder hay-cutters.
12. Horse-powers, adapted to one or eight horses.
13. Revolving horse hay-rake.
14. Machine to cut and stuff sausage meat.
15. Budding's Lawn Mower.
16. The Kendall Cylindrical Churn.

Collection of garden, field, and grass seeds and fertilizers.

95. Mayher, John, & Co., *New York.*—Manufacturers.

A collection of agricultural implements and machines.

96. Longett & Griffino, *New York.*—Manufacturers and Agents.

General agricultural implements and appliances, including Prouty & Mears' Plows, John Rich's Patent Iron-beam Plow, Hickok's Patent Cider-mill and Press, Bryan's Patent Fanning-mill, corn-shellers, straw-cutters; Emery's Threshing Machine, Circular Saw, and Seed Planter; Partridge's Forks, and Potatoe Hoes; L. Bolles & Co.'s solid Shank Hoes; W. C. Barker's Improved Screw-nib Scythe Snaths; and a large variety of horticultural tools, &c.

97. Ralph & Co., *New York.*—Manufacturers and Proprietors.

Collection of general agricultural and horticultural implements and machinery.

98. Thomas & Livingston, *Utica, New York.*—Proprietors.

Patent lever gate.

99. Emery & Co., *Albany, New York.*—Proprietors and Manufacturers.

1. Emery's Patent Changeable Railroad Horse-Power, adapted to driving threshing machines, circular saws, cotton-gins, corn-shellers, &c., &c

[The angle of elevation necessary to operate this power is less than one inch and a half to the foot. It has also an arrangement for adjusting the chain, and a brake for stopping the whole instantly, all within the power, and independent of the band and pulleys.]

2. The Overshot Thresher and Vibrating Separator.

[This is an ordinary spike thresher, but admits of a level feeding table, thus avoiding the accidents which often occur with the inclined feeding board, by preventing hard substances, sticks, and stones from getting into the machine and breaking the spikes. A separator may be attached.]

3. Emery's Albany Corn Planter and Seed Drill.

[This machine makes its own furrow, counting and measuring its own quantity of seed; deposits it in hills or drills at pleasure, and at any distance apart; covering the seed after it is dropped, and compressing it, after it is covered, by means of a roller; and doing the whole at the same time.

The machine is quite simple. The quantity, as well as the different kinds of small seeds, is regulated by means of movable tin plates, with different sized holes, which are placed at the bottom of the hopper, the seeds being forced through the holes with a circular brush. For planting corn, a wooden cylinder is substituted, just filling the hopper-mouth, the bottom of which is left open.

The cylinder is perforated with cavities sufficiently large to receive any number of kernels of corn, beans, peas, &c., and a set screw, with the head just filling the cavity, is inserted. The quantity is regulated by turning the screw up or down, at pleasure. One acre per hour is readily planted, and is a fair estimate of its capability when the rows are three feet apart.]

100. Eddy, Dyer & Co., *Union Village, Washington County, New York.*—Manufacturers.

Agricultural implements and machinery, including Taplin's Patent Lever Horse-power; Thresher; Wrought-iron Beam Plows.

101. Hargreaves, Thomas C., *Schenectady, New York.*—Inventor.

Corn-husking machine.

[The unhusked ears of corn are placed in grooves upon a circular iron plate, with the stock-end against the rim near the centre; the plate moves round horizontally, and conveys the ears to the cutters (a double blade sliding down together), which descend and partially sever the upper side of the husk, and divide the cob at the first row of kernels. One blade retains the husk while the other forces out the ear into the receiving trough, and, as the next ear comes ready for the cutters, a spur removes the previously severed husk. This machine will husk as fast as a man can place the ears in the grooves.]

102. Glover, Townsend, *Fishkill Landing, New York.*—Inventor and Proprietor.

Models of the fruits of America.

[These models are designed by the artist for the use of horticulturalists, or horticultural societies, for the purpose of identifying and comparing the different varieties of fruit, when out of season or otherwise unattainable, and likewise for the instruction of young horticulturalists or farmers wishing to plant fruit-trees or orchards, and not

yet familiar with the history or peculiar habits of the tree, flavor of the fruit, time of ripening, soil best adapted to its culture, &c. A full, yet concise descriptive label will be engrafted to each specimen. Models of blossoms, young wood, leaves, &c., are classified and arranged in a similar manner; also, the *insects* destructive to orchards or gardens, both in the larva, pupa, and perfect state, modelled and preserved, so that the horticulturalist and agriculturalist may recognize their enemies whenever and wherever they may be seen, and have the most approved method for their destruction in their various states. These data accompany each specimen.]

103. Kelsey, Christopher J., *Livingstonville, New York.*—Inventor.
Kelsey's Patent Folding and Adjustable Grain Cradle.

104. Babcock, A. S., *Albany, New York.*—Manufacturer.
Horse-shoe and sole tiles for draining land.

105. Hughes, James, *Cambridge, Indiana.*—Patentee and Proprietor.
Hominy and samp mill.

106. Crossman, Edward, *Canaan Four Corners, New York.*—Manufacturer.
Scythe rifles or sharpeners.

107. Downer, John R. & R., *Castleton, New York.*—Manufacturers and Proprietors.
Revolving horse-rake, and an improved harrow.

108. Tuthill, Thomas J., *Elmira, New York.*—Patentee and Manufacturer.
Rotary cutter plow or cultivator.

109. Moody, Edmund, *Birmingham, Connecticut.*—Manufacturer.
Vegetable cutter, for slicing and grating vegetables for fodder.

110. Mann, Terance, & Co., *Troy, New York.*—Manufacturers.
MacGregor's Patent Agricultural Caldron for Furnaces.

[Designed for boiling vegetables, lard, oil, sugar-maple sap, tar, wax, resin, and for various other manufacturing and agricultural purposes.]

111. Dickson, Perry, *Blooming Valley, Pennsylvania.*—Patentee.
Improved sled lock.

112. Abbe, R. M., *Enfield, Connecticut.*—Inventor.
Model of a pen, illustrating an improved method of feeding swine.

113. Arnett, William D., *Fairfield, Iowa.*—Inventor.
Patent improved road-scraper.

114. Bell, D. D., *Rochester, New York.*—Patentee.
Bell's Potatoe-digging Machine.

[A four-wheel carriage, between the forward wheels of which is suspended a cylinder, armed with iron fingers, like potatoe-hoes, which, being made to revolve, scoop the potatoes out of the ground, carry them over and discharge them upon a shaking-screen, which serves to rattle off the dirt, and from which they are deposited in a cart or box behind.]

115. Duncan, Horace, *Lyman, New Hampshire.*—Proprietor and Assignee of Patents.
Dewey's Patent Spring Horse Rack, with Haynes' patented improvement.

116. Bacon, Almon, *Lyme, Connecticut.*
Corn and fruit baskets.

117. Disbrell, Joseph, *Sidney, New York.*—Manufacturer.
One hand-made ax-helve.

GREAT BRITAIN AND IRELAND.

118. Croskill, William, *Beverly, near Hull.*—Manufacturer.
Agricultural implements and machinery.

1. Crosskill's Patent Serrated Roller, or Clod-Crusher.

[This roller consists of cast-iron metal disks, or roller parts, placed loosely upon a round axle, so as to revolve independently of each other. Each alternate ring is made larger in the eye, thereby effecting the best means of self-cleansing.]

2. Crosskill's Improved Norwegian Harrows.

[The spikelets pulverize the land five or six inches deep, without clogging. The frame is arranged with side-levers and regulators, so as to raise or adjust the harrows as required.]

3. Williams' Patent Diagonal Harrows.

[This set consists of three harrows, and whiffletrees. Each harrow is square, or rather diamond-shaped, and formed of straight bars of iron, placed in diagonal positions, to which teeth are so fitted that each cuts a separate track, while the draught is from the whiffletrees. This is a good seeding-harrow, and was awarded the bronze medal for that feature.]

4. Crosskill's Improved Archimedean Root-Washer.

[Potatoes, turnips, etc., being delivered into a hopper at one end, pass into an inclined cylinder having two chambers, in the first of which they are confined and threshed, by turning the handle forward; when thoroughly cleansed, by turning the handle the other way, they pass into the second chamber, which is constructed in the form of a spiral, along which the vegetables pass until they drop into a spout outside.]

5. Crosskill's Model Farm and Harvest Cart.
6. Machine-made cart-wheels and axles.
7. A street-sweeping machine.

119. Bigg, Thomas, *London.*—Inventor.
Apparatus for washing sheep.

120. Ball, Robert, *Dublin.*—Inventor.
Improved dredge for naturalists.

[A compact net-work of small cords is attached to a mouth-piece of iron, which drags on sea-bottoms, and secures whatever may come in its way.]

BRITISH COLONIES—CANADA.

121. Holwell, Antrobus W., *Quebec.*—Inventor.
A fruit gatherer.

[The fruit is picked by two fingers at the end of a long pole, and passes through a wire ring into a cloth tube until it reaches the hand of the gatherer.]

122. Von Baocklin, Winter & Co.—*Brandford, Canada East.*—Manufacturers.
Threshing machine.

123. Robertson, John, *Long Point, Canada East.*—Patentee and Proprietor.
Seed-sower.

124. Hurlburt, Samuel, *Prescott, Canada East.*—Inventor and Proprietor.

[Patent plow, with the working side of the mould-board uniformly convex from front to rear, and also from top to bottom, so that a concave arc of a circle, when applied vertically to the line of the base, shall adapt itself to every part of the mould-board; also, when applied horizontally, will fit every part accurately.]

125. Jones & Co., *Gunanogue, Canada West.*—Manufacturers.
Shovels and spades.

FRANCE.

126. Lavoisy, Amedee Desire, *Rue Montmartre, Paris.*—Inventor.
Mechanical churns, oval in form and made of tin, with wooden ends, placed horizontally, and appearing somewhat like the Kendall Churn of American invention. There are two dashers ranged lengthwise through the churn upon square iron shafts, these are formed with arms or fingers which play between each other as the shafts revolve, the motion being communicated by cog wheels at the crank end of the churn. A slide closes the top of the churn, and it is ventilated by a tube passing through it. This is removed after the process of churning is commenced.

127. Coulaux & Co., *Molsheim, Bas-Rhin.*—Manufacturer.
Scythes and horticultural implements, pruning knives, garden shears, hoes, and rakes.

128. Chateyer, *Firming, near St. Etienne, Loire.*—Manufacturer.
Scythes, sickles, and shovels.

THE GERMAN STATES.

129. Kaemmerer, Capt. E., *Bromberg, Prussia.*—Inventor.
A seed drill or sowing machine, arranged to sow from six to thirty-two pecks (Prussian) an acre.

130. Schmidt, P. L., *Elberfield, Prussia.*—Manufacturer.
Shovels and spades.

131. Kade, Jacob, *Achern, Baden.*—Manufacturer.
Straw cutters; scythes with short, broad and thin blades, forged to an edge without grinding.

THE AUSTRIAN EMPIRE.

132. Beyerle, Jacob, *Waidhofen.*—Manufacturer.
Scythes and straw-cutting knives.

133. Penz, J., *Mulherau, Tyrol.*—Manufacturer.
Scythes of different patterns.

134. Weinmeister, J., *Brühthal.*—Manufacturer.
Samples of scythes.

135. Hierzenberger, G., *Leonstein.*—Manufacturer.
Samples of scythes.

136. Gaat, A., *Kufstein, Tyrol.*—Manufacturer.
Different kind of scythes.

137. Pamer, S., *Schalchen.*—Manufacturer.
Scythes and chaff-cutters.

138. Offner, Brothers, *Wolfsburg, Carinthia.*—Manufacturers.
Scythes of various kinds.

139. Weinmeister, G., *Spital.*—Manufacturer.
Scythes and sickles.

140. Feitlinger, J. A., *Eppenstein.*—Manufacturer.
Various scythes.

THE ITALIAN STATES.

141. Perancini, E., *Turin, Sardinia.*—Inventor and Manufacturer.
Hay and grain mowing machine.

142. Coccone, Guiseppe, *Turin, Sardinia.*—Inventor and Manufacturer.
Seed and grain sowing machine.

[This is a hand-machine, and consists of a number of tubes about an inch in diameter and three feet in length, arranged in a frame, at a proper distance from each other for sowing in drills. The seeds are placed in a cavity at the top, and the quantity regulated by springs easily controlled. It is drawn after the operater, the ends of the tubes describing the furrows.]

BELGIUM.

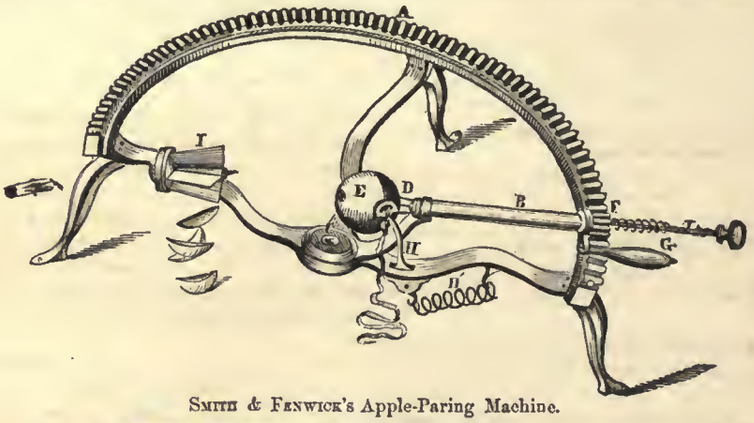
143. De Beaune, Ulaic, *Jemmapes.*—Inventor.
Apparatus for moistening grain.

THE NETHERLANDS.

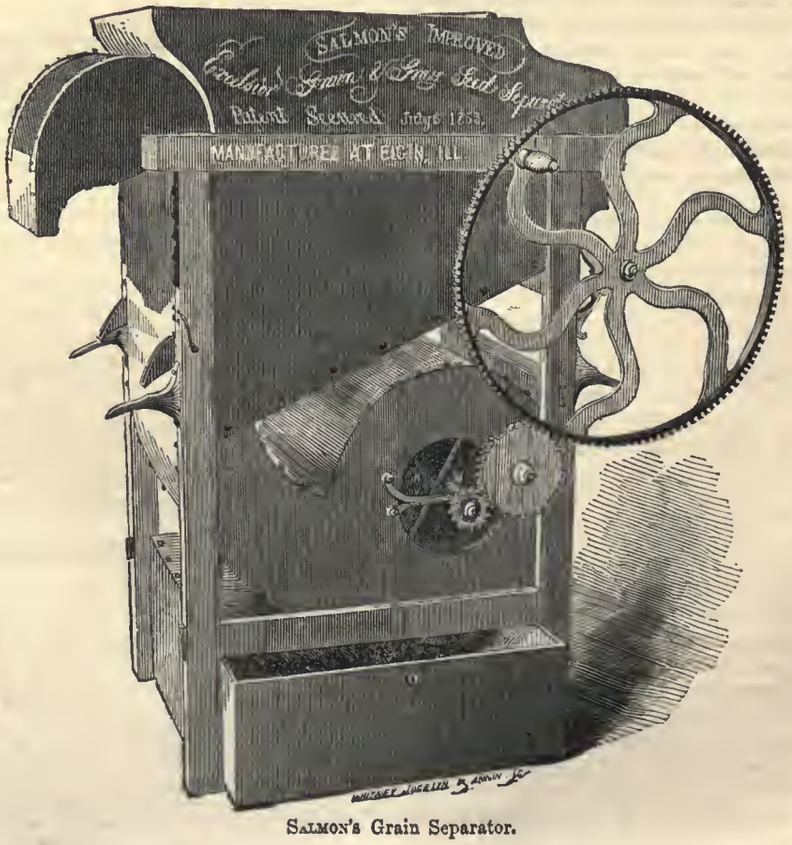
144. Jenken, W., *Utrecht.*—Manufacturer.
A swing-plow.

145. Sondermeyer, J. K., *Rotterdam.*—Inventor.
An earth-borer, designed to promote the growth of fruit-trees.

The following cuts, not being at hand when the pages to which they belong were made up, are placed at the end of their class:



Smith & Fenwick's Apple-Paring Machine.



Salmon's Grain Separator.

SECTION II. CLASS X.

PHILOSOPHICAL INSTRUMENTS, AND PRODUCTS RESULTING FROM THEIR USE—MAPS, ETC.

This is one of the most important classes in our volume, if not always the most interesting to the general observer. The importance of the instruments used in our coast survey has justified a description of them which, under other circumstances, might be considered too minute; although, as a proof of the labor and scientific skill which has been employed upon this interesting subject, they have been looked upon with great interest even by the unscientific visitor. But the whole class is one which is too well understood to require a special introduction.

1. Bureau of the Coast Survey of the Treasury Department of the United States, *Washington, District of Columbia.*—Proprietor.

1. One tube and two supporting trestles of the apparatus used in *measuring* the *base lines* of the Coast Survey Triangulation. This apparatus was made in the C. S. Office, during 1845 and 1846, by Mr. Wm. Wurdeman, then in charge of the C. S. Instrument-shop. The principles and the general plan were elaborated by Professor Bache, and the details were devised and executed by Mr. Wurdeman. Mr. Joseph Saxton and Capt. A. A. Humphreys, U. S. A., assisted Professor Bache in many of the fundamental experiments on the bars, &c. Two tubes and six or eight trestles make up the complete apparatus.

[During the past season, the general public has, for the first time, been enabled to inspect the apparatus employed in measuring the base lines of the Coast Survey triangulation. A large spar-shaped tube, sustained on two tripod-trestles, has stood just opposite the great north window, a total enigma to most observers, until, on reading the attached descriptive card, it proved to be the thing probably the most remote from their conjectures. To the uninitiated, its mute, plain exterior gives but little idea of its objects, mechanism, and mode of use. Nor would a casual observer at all appreciate the delicate experiments whence its structure was deduced, or the marvellous accuracy of results which it affords. The lack of drawings, and the complication of parts, will here prevent the presentation of all the smaller details; but a general synopsis of the theory, structure, functions, and method of using this apparatus, will, without these, be tolerably intelligible.

The base line of a triangulation is that distance, carefully measured along the ground by a standard measuring-apparatus, from which, as an origin, all the remaining triangle sides are derived by angle observations and computations. This line, usually from five to ten miles long, being selected and opened conveniently for measurement, and for the proposed triangulation, is measured with the utmost accuracy, to determine the number of standard units between the station-signals at the extremities. Any error in the base-length affects proportionally all the derived distances; hence the need of the greatest attainable precision in its measurement. Also any error of comparison, between the apparatus and the standard unit, affects proportionally, and in cumulation, the entire operation; thus vitiating the geodetic results in a very rapid ratio. Hence trigonometrical surveys, extensive enough to afford geodetic results of value, demand the highest accuracy, delicacy, and constancy, in the base-measuring apparatus used.

The United States sea-coast is distributed, for surveying purposes, into eleven sections; in each of which at least one base line will be requisite, and on the Gulf and Pacific coasts several extra bases may be necessary. Thus there will be a total of nearly a hundred miles actual base-line, to be measured with the utmost accuracy. This fact made it important, even in an economical sense, so to arrange the base apparatus as that extreme delicacy and constancy should be combined with the greatest facility of use and adjustment. Experience has proved the solution of their problem, embodied in the C. S. apparatus, to be highly satisfactory.

The prime condition to be satisfied in this apparatus, is, that the distance between the two agate ends shall, under all circumstances of temperature, or weather, incident to its use, remain steadily the same constant quantity. The distance between the extremities of a bar, of any known substance, undergoes such variations during tempestuous weather-changes, as can by no means be disregarded in measuring bases. Usually, single iron bars have been employed, and a correction for the observed temperature during each contact has been applied, to reduce the length to the standard value, previous experiments having determined these corrections. But, besides the labor of reduction, the true temperature of a bar, at a given instant, cannot be so thoroughly known as to make the proper corrections entirely certain. With the purpose of wholly eliminating these temperature corrections, the principle of compensation has been introduced into base-apparatus, in a manner essentially analogous to that long familiar in the gridiron or compensating pendulum-rod. Colonel Colby first thus applied this principle in 1827, when constructing the apparatus for measuring the Lough Foyle Base in the Irish Ordnance Survey. It was again, and independently applied, in a mode quite his own, by Mr. Simeon Borden, of Fall River, where, during the winter of 1830–31, he constructed his base-apparatus for the Massachusetts State Survey. Mr. Borden made no provision for producing in the two bars used an equal rate of change during variations of heat, but the double-case used by him imposed an efficient check on the rapidity of these variations around the bars. Colonel Colby attempted, by the aid of varnishes and lamp-black coatings, to determine by numerous experiments in 1827, so to regulate the absorbent powers of the two bars as to equalize their rates of temperature-change when exposed to the same source of heat. But this was a physical impossibility in the bars which he employed, presenting equal cross-sections of brass and iron; though a tolerable approximation was thus obtained. Colonel Colby's method is faulty in failing to take specific account of the different conducting powers, and specific heats of iron and brass. The method introduced by Professor Bache is capable of making the rates of the two bars perfectly equal. By numerous experiments, in 1845–46, he has so determined the two cross-sections, with reference to the specific heats and conducting powers of the two metals, that the two bars, throughout their masses, change temperatures a given number of degrees in equal times, when in like circumstances. By applying the same varnish to both bars, the superficial absorption is equalized, and a slight variation of the varnish on one bar, as indicated by experiment, completes the final adjustment of this equality. Thus the effects of ordinary variations of heat, in displacing the end agates, has been rendered quite inappreciable; and hence thermometric correctives are eliminated. In addition to this modification, the C. S. apparatus presents several valuable points of novelty, among which may be specified the mode of sustaining the bars on the truss-frame, the application of Bessel's contact-lever, the trestle movements, and the arrangement for the fine motion of contact.

The tube is six meters long between the agate plane on one end, and the horizontal blunt agate knife-edge on the other. A bar of brass, and one of iron, a few inches short of six meters long, are supported, the iron being above, and parallel to the brass bar; and at the sector, or rear end, they are connected firmly by a notched, iron cross-piece, screwed to each bar by two screws sunk through it into their plane-end faces. The brass bar, which expands more rapidly, and has a longer cross-section than the iron bar, is supported on rollers, mounted in suspending stirrups; and the iron bar rests on small brass rollers, fastened to it, and running on top of the brass bar. Thus, while the two bars are relatively fixed at one end, they are elsewhere free to move, and manifest at the disengaged ends their entire expansions and contractions. This free end is called the compensation-end, and the two bars are here connected by the vertical

lever of compensation, which is attached to the lower, or brass bar, by a single pin, and carries a steel knife-edge above, which bears against a steel plane on the end of the iron bar; at the top of this lever a second knife-edge, facing from the bars, bears against a steel plane in the eye of a loop, made in a small horizontal rod. This rod extends through two supporting-guides, and a helical zinc-spring, through which the rod runs, acts between the rear guide and a shoulder on the rod so as to force the loop-plane against its knife-edge. The same spring maintains an equable contact-pressure of the lower knife-edge, and of the hinge-pin. The looped, or sliding rod, extends some inches forward of the compensation-lever, and on its end is an agate plane, forming the fore-extremity of the tube, against which the contact of the next tube is made. As the iron bar expands less than the brass, the knife-edge resting against its end can be so adjusted, by moving it up or down, as that, in all temperature-variations, the limiting plane agate surface shall always be at the same distance from the opposite, or sector-end of the tube. The three bearings of the compensation-lever are so determined as to satisfy this condition.

The stirrups, sustaining the rollers on which the brass bar runs, are riveted at top to the under-surface of the truss work, and the two bars are kept in place in the stirrups by lateral adjusting-screws, which also serve to rectify the bars. There are two members of the truss-work, one being vertical and one horizontal. They are made by shaping for the purpose plates of boiler-iron, and cutting out circular discs, so as to make the weight a practical minimum. The vertical sheet is joined along the centre line of the horizontal sheet, by riveting both sheets to angle-irons in the two re-entering angles. A continuous iron tie-plate, turned up in a trough form, connects all the lower ends of the supporting stirrups.

The *sector end*, or the rear extremity of a tube in use, embraces a sector for reading the inclination of the bars, a contact-level to indicate when the proper contact pressure between the two extreme agates is reached, and the "*fine motion*" fixtures by which this contact is made. At this end, too, are three rods leading to screws in the rear trestle; one to slide the tube lengthwise, another to slide it transversely, and the third to raise or lower the rear end. The principal observer makes the sector end manipulations. The sector end terminates in a sliding-rod, which plays through two small upright bars; and at its rear extremity bears a horizontal, blunt, agate knife-edge, which, in measuring, is abutted against the compensation-end agate plane of the previous tube.

This rod abuts at the inner end, against an upright *lever of contact*, which is mounted at bottom on a hinge-pin, sustained by two small drop-braces abutting for the purpose, and it is steadied by a projecting pin between an adjusting-screw and a small spring. This lever, at top, is so arranged as to press against a tongue or lever descending from the middle of a *level of contact*, which is mounted on trunnions, resting on a supporting bracket above. The sliding-rod, pressing against the lever of contact, bears its top against the tongue of the level, thus turning it, and, in so doing, overcomes a preponderance of weight given to the forward end of the level. This preponderance being constant, a constant pressure of contact will always be requisite to bring the bubble to the centre.

The *sector* is an arm, bearing a long level, attached by a center-pin to a projection from the crossbar connecting the two main bars. At the other end is a graduated arc of 10° each way from the zero, which is read by a fixed vernier, along which it moves by a tangent screw. The readings, with the bubble at the center, are the bar inclinations. Both the lever of contact and the contact-level make part of the sector, and partake in its motions. The end of the sliding-rod bears against a cylindrical surface on the lever of contact, whose axis is that of the sector motion; and, as the rod also is placed radially in this cylinder, the sector motion is not obstructed. As the contact is always made with the main level horizontal, the pressure acts always alike on the level preponderance.

What is called the "*fine motion*," or the delicate longitudinal motion given to the forward system of bars, in adjusting the contacts between successive tubes, is produced by means of a compensating-rod, or tube, one end of which is attached to the truss-frame, over the rear trestle, and the other to the crossbar. A thumb-screw turns in a collar, which bears against the crossbar, and its thread acts on a nut in the rear end of the compensating-rod. This rod consists of a series of alternate iron and brass tubes, arranged concentrically, and fastened alternately at opposite ends. The end is attached to the truss over the rear trestle, to prevent movements of the bars by truss expansions and contractions. A spiral spring is arranged below the brass bar, to so react against a bracket as to press the bars back against the collar of the thumb-screw. The observer, in turning this screw with his left hand, can easily watch the contact level.

The entire arrangement thus described, except the sliding ends, is enclosed in a double, tubular tin-case, composed of two halves riveted together in the middle, and tapering towards the ends. The truss-frame is sustained in it on two diaphragms, one over each trestle. The inner and outer tin-casings are an inch and a half apart, and the inclosed air-stratum forms an efficient non-conductor. The outer surface is also painted white, and when in use the tube is covered with woolen coatings, which, with the double-casing and thorough compensation, obviates all need of covering tents or screens in measuring. The ends of the case are closed across, and guard-cylinders are attached to protect the sliding-rods, and a covering-cap protects the agates when not in use. There are three glazed openings in the case; one being at the compensation-point, one exposing the sector, &c. During the measuring, a thermometer is placed opposite to each opening, and is regularly read, in order that, if any new conditions to which the apparatus is liable should be discovered, the data for their application may be supplied. For transportation, the covers are screwed over the ends, and the whole is put in a wooden box tapering towards the ends.

The tube, in measuring, rests on two trestles. Two trunnions are attached to the tube at the point over the rear trestle, and a straight block with two small pins is arranged to rest on the cap of the foremost trestle. The rear trestle-cap sustains a strong Y horned-fork, with a spread base; the tube-trunnions rest in the Ys. Each trestle has three legs, composed of one iron cylinder moved in another by a rack and pinion, by working which the trestle-top is raised or lowered, and approximately leveled. Each leg terminates in a vertical foot-screw, which together gives the final leveling adjustment. In measuring, these foot-screws rest in three radiating grooves of an iron bed-plate. A strong screw in the axis of the trestle supports the head-plates; a crank and bevel wheels turn this in a long cylindrical, or tubular brass-nut. On the cap of each rear trestle are two plates arranged to slide, the one transversely, and the other lengthwise. These motions, being communicated by screws attached to the sliding-plate, and to the plate underneath, on which it rests. Movable handles extend back to the position of the observer's right hand, by which he turns the transverse and longitudinal motion screws, and the axis-elevating screw, to complete the general adjustment of the tube. The fore trestle-cap is also provided with a crank and screw or a transverse adjusting motion; and the axis-elevating screw, the leg-racks and pinions, and the foot-screws, are alike in both trestles.

Two tubes and six or eight trestles are used in base-line measurements. The alignment of trestles and tubes is made with a theodolite, and by two sights on each tube. Four men readily carry forward the tubes, and the total force of a measuring party is usually twelve men, including observers and workmen. Great care is bestowed on marking the extreme points of base lines so as to insure accuracy and permanence. Marks are established at the end of each day's work, and at the contact nearest each mile. The principal observer, with an aid, makes the contacts; the first assistant directs the forward tube, and another directs the alignment with a theodolite. A careful recorder notes the observations, and an intelligent aid places the trestles. The preparation and grading of the line rarely requires great labor, especially on level sand lines. Comparisons before, after, and sometimes during a base-measurement, are made between the apparatus and a standard iron bar, taken to the field for that purpose. Thus the good condition of the apparatus is insured. A modified reflecting pyrometer is used in these comparisons.

Three Coast Survey bases have been measured with this apparatus.

The first base was that on Dauphine Island, near Mobile, about seven miles long, which was measured by Professor Bache in 1847. The party was six weeks on the ground (from April 30 to June 12), though only seventeen working-days were consumed in the actual measurement. The greatest day's work was 183 tubes, or near seven-tenths of a mile. The greatest supposable error for this base, as deduced from some measurements, is less than six-tenths of an inch.

The second base, measured by Professor Bache with his apparatus, was that on Bodie's Island, North Carolina, of about six and three-quarters miles in length. This measurement was completed in ten working-days. The greatest day's work was 1,692 meters, or 1·06 miles, in eight and a half hours. Several partial remeasurements gave the total probable error at less than one-tenth of an inch in the entire base, and the greatest supposable error as less than three-tenths of an inch.

The last base measured (also by Prof. Bache) was that on Edisto Island, South Carolina, which occupied from the 3d to the 18th of January, 1850, thirteen days being occupied in the actual measurement. Its length is about six and two-thirds miles, and its line was much more uneven than the previous one. The greatest day's work was 1,122 meters, or about three-fourths of a mile. A partial remeasurement gave one-tenth of an inch as the probable accidental error of measurement for the whole base.

To estimate the quality of these results, the subjoined facts are cited as the most appropriate for comparison. Captain Yolland, in his work (published in 1847) on the Lough Foyle Base in Ireland, measured with Colonel Colby's apparatus in 1827, says: "The greatest distance measured in one day was about 600 feet, which occupied upwards of fifteen hours of almost uninterrupted labor; but a very fair average quantity would be performed by completing half the quantity daily." "The general average progress of the whole base is 461 feet per diem." The measuring party varied between fourteen and fifty-five, total strength. In point of accuracy, though the elements of comparison are deficient, the advantage is surely not in favor of the Irish base-line. The probable microscopic errors, alone, exceed those of the total apparatus with the contact-level. In the Survey of Hindostan, Col. Colby's apparatus was also employed, with the following results: The Dehra Dun Base was measured between Dec. 1st, 1834, and Jan. 31st, 1835; and it was remeasured between Feb. 19th and March 28th, 1835, specially to test the apparatus. Its length is 39.183,87343 feet, or 7.42 miles. The difference of the two measurements was 2,396 inches, or 0.3 inches per mile. The Seronj Base, 38.413,367526 feet long, consumed from the 1st of December to the 18th of January in its measurement. The Manjra Base, 41.578,536 feet long, consumed thirty-nine days of nine and a half hours in its measurement.

These results show that the Coast Survey Base Apparatus combines superior accuracy and facility of use, in a degree entitling it to a preference over any other combination the workings of which are now known to us.]

2. Saxton's Reflecting Pyrometer, or Comparator of End-measures of Length.

[This instrument is almost exclusively employed in the Coast Survey, and in the Office of Weights and Measures, for the comparison of measuring bars, and of the base-measuring apparatus, with the ultimate standards; and is, moreover, peculiarly adapted to measuring the variations in length of a bar at different temperatures. Much experience of its operation has caused it to be most highly appreciated for its convenient working, its sensibility, its simplicity, and because it obviates the disturbing

action of the observer's personal heat. This device is due to Mr. Joseph Saxton, of the U. S. Weights and Measures Office, who has now employed it in various forms for more than twenty years.

The *reflecting pyrometer* consists essentially of a small mirror mounted on a vertical axle, and so arranged as to be rotated by all changes in the length of the experimental bar. The graduations of an arc whose center is in the mirror-axle, and whose radius is about eighteen feet, are reflected by the mirror into a reading-telescope, mounted permanently over the middle, or zero point of this arc, and pointed towards the mirror, which direction is also perpendicular to the experimental bar length. This bar abuts at one end against a fixed steel plane, and running thence, over supporting friction rollers, abuts at the other end against the plane steel head of a micrometer-screw, with a hundred threads to the inch. This screw runs in the end of a small rectangular sliding-bar; and, by turning it, this bar may be so moved, through its supporting guides, as to reach its zero position. These guides rise from the general bed-plate, which supports the bar, the mirror, and all its fixtures; the bar and bed being of the same kind of brass. A bracket, springing from the side of the bar, gives a fastening-point for one end of a small silver chain, which runs parallel to the sliding-bar, and makes one turn around the mirror-axle, to the circumference of which it is fastened by a pin through one link. It then extends a short distance farther, parallel to the bar, when it is fastened to the end of a flat spring, standing out perpendicularly from the side of the bar, which serves to keep the chain always drawn equally tight. By this chain arrangement, the mirror-axle is turned exactly with the movement of the sliding-bar. Thus the minute bar movements are seen magnified in the double ratio of the graduated arc radius, to the radius of the chain mean circle around the mirror-axle; a ratio experimentally determined. The mirror axle is mounted vertically between two conical pivots, fitting into cups in the axle ends, the top pivot being the end of an adjusting screw, through an arm of a supporting column back of the mirror. The mirror is firmly and permanently attached to the axle, which is notched to receive it. A spring or weight is so arranged as always to press the sliding-bar against the experimental bar with a nearly constant pressure.

With the present radius of about 18 feet, each gradation is nearly one-fourth of an inch long, and corresponds to a movement of the sliding-bar of one 25,000th of an inch. A practiced eye can read quite correctly to the 100,000th of an inch, as the pyrometer is now arranged. This minuteness of reading could readily be exceeded, either by an increased radius or by gearing up; but the present degree of sensitiveness is all which is desired, or which would be of use, while incidental errors retain their present values.

For verifying measures required to be always of the same length, such as the base apparatus when in use, a simpler form of the reflecting pyrometer is employed, in which the end of the measure abuts directly against a ball on the end of an arm projecting from the minor axle. In experimenting on the compensation of the base apparatus, as also in measuring the dilatations and contractions of bars at various temperatures, nothing can exceed the reflecting pyrometer in delicacy, steadiness, and convenience. For different cases of practice, its dimensions and combination can be widely varied.]

3. A zenith telescope, arranged for observing latitudes, by Captain Talcott's method; made in the Coast Survey Office, by Mr. Wm. Wurdeman. This instrument is preferred by the Coast Survey observers to any other as a field instrument for accurate latitudes. [See C. P. Record, p. 121.]

4. A 46-inch transit instrument, made by Troughton & Simms, London. Used for the accurate determination of local time, as required for longitude and other observations.

5. A 12-inch theodolite, made by Gambey, Paris, and verified by Arago. Both limbs are 12-inch circles. This instrument is used for horizontal and vertical angles, and azimuths, in the primary triangulation of the flat and wooded Southern coast; it being, in many instances, elevated on wooden framed tripods over forty feet high. Its size permits it to be readily raised and lowered. The peculiar excellence of its graduation gives a very good quality of primary observations in the restricted triangles of a level country, especially as its repeating properties are of a high order. This instrument is also used for secondary triangulation observations at the North; the primary observations, where long lines are practicable, being made with 24 to 30 inch theodolites.

6. A 6-inch theodolite, by Brunner, Paris, for secondary or tertiary triangulation.

7. A heliostat. This instrument, from Silbermann, Paris, is intended to reflect an image of the sun into the telescope of a theodolite at a distant station. A train of clock-work so rotates a mirror that, on being once adjusted, it follows the sun's motion, requiring only winding and occasional adjustment to give a constant vivid station signal when the sun shines.

8. A complete plane table, including the tripod, motion-work, table, and alidada; all made in the Coast Survey Office. Also a meter scale of one 10,000th. The tripod supports leveling screws and a motion-work, to permit the turning, clamping, and firm support of the board, on which a sheet of paper is held by curved pinching-springs. On the board rests the alidade, which is a simple transit, supported vertically on a straight-edged ruler. The station occupied being plotted, the straight edge is kept on this point, and the transit telescope is directed successively to the various signals and objects to be located, the direction-line of each being drawn in pencil by the straight edge. A second known station being in like manner occupied, and the same objects being observed upon the direction-lines, intersect the corresponding ones from the first station, at the relative position of the signal or object. Thus any required number of points are obtained, and the details of ground are worked in by reference to them.

9. A meter chain and pins, of the kind used in connection with the plane table for supplementary measurements.

10. A small transit and tripod, used for opening lines to be observed over; made in the Coast Survey Office.

11. A sextant, by Troughton & Simms, London, of the kind used by the hydrographic officers in determining the positions of auxiliary signals, and of sounding-lines.

12. A sextant, by Gambey, Paris; used as above, and esteemed its equal in quality.

13. Saxton's Self-registering Tide Gauge, made in the Coast Survey Office; also a roll of the paper used on it. This instrument causes a long sheet of paper to move forward uniformly by a clock-work, and a pencil is so connected with the flood that, as this rises or falls, the pencil traverses the record-sheet proportionally, and thus produces a very perfect record-curve, which exhibits the entire tidal movement, and its height at each instant. [See C. P. Record, p. 99.]

14. Saxton's Metallic Thermometer, for deep sea-soundings. These thermometers are made in the Coast Survey Office, for gulf-stream and oceanic explorations. A breguet coil of soldered silver and platinum plates, fixed at top and free at bottom, gives rotation by the unequal expansions of the two metals to an index-hand, which carries a stop-hand. All is so arranged and incased as safely to be sunk to any depth, and to give the water a constant, but regulated access to the coil. Thus temperature readings are obtained at the greatest depths. [See C. P. Record, p. 42.]

15. Stellwagen's Lead, for bringing up specimens of bottoms from great depths; also some vials of ocean-bottom specimens thus obtained. This lead, invented by Lieut. Stellwagen, U. S. N., when on Coast Survey duty, and patented by him, consists of a bar, ending in a pointed conical cup at bottom. A soft leather washer is fitted on over the bar, so as to cover the cup on its being drawn up. The lead, striking the bottom point downwards, buries the cup in the sand or other substance, which overflowing into the cup, is there retained by the washer in the ascent. Microscopic examinations of the numerous specimens thus obtained have been made by Professor Bailey, of West Point, and by Assistant L. F. Pomtales, of the Coast Survey, and have developed numerous interesting facts of submarine life; the *foraminiferæ*, especially, abounding among the varieties of infusoria found. Distinct zones of species are found on the ocean bottom, depending partly on depth and partly on latitude and relation to the Gulf Stream. Perfect living specimens of foraminiferæ and corals have recently been drawn up from the depth of 1,050 fathoms, being much deeper than life had before been known to extend. These specimens were obtained by Lieut. Craven, United States Navy Assistant Coast Surveyor, in exploring the Gulf Stream, off the Florida coast.

16. A case crushed by the pressure of the ocean on being sunk to a great depth. Attempts to protect bulb thermometers by strong casings proved inefficient at considerable depths.

B. *Drawings.*

17. Specimen plane-table, or topographical sheets, showing the prevalent style of Coast Survey field topography and contouring, in the original or manuscript sheets. Scale $\frac{1}{10,000}$.

18. Specimen hydrographic sheets. Scale $\frac{1}{20,000}$. These illustrate the practice of the Coast Survey hydrographers in plotting soundings, and in presenting the other elements of complete charts, such as currents, tides, bottoms, and curves of depth. The requisite triangulation and plane-table points, as also the shore line, are, where practicable, furnished to the hydrographic parties, constituting the foundation of their charts, as also the means of uniting several sheets in reducing.

19. Eastern series. Sheet No. 2. Scale $\frac{1}{80,000}$. A finished topographical reduction, showing the style of drawings made in the Coast Survey Office, by combining and reducing to the general coast publication scale several plane table sheets. The magnifying glass is constantly used in making this class of reductions, and the methods by corresponding squares by the *camera lucida*, and by the pentograph, are all to some extent employed in reducing.

20. Santa Barbara, a reduced reconnoissance drawing; a style of work considerably used for the preliminary surveys executed on the Pacific coast, it being bold and expressive, but resting on points determined in advance of the systematic survey, and hence less accurate than the finished maps.

21. Richmond's Island Harbor. This chart is exhibited in all its stages. Starting from the plane-table sheet, there is the hydrographic sheet, the topographical reduction, the hydrographic reduction, the engraved plate, the electrotype alto, the electrotype copy, and a copper-plate impression. This illustrates the usual Office order for like charts.

C. *Plates.*

22. The engraved copper-plate original of the general coast chart from Gay Head to Cape Henlopen. An electrotype alto, deposited by electrolytic action on the engraved original, and presenting all its lines and dots in relief and reversed. An electrotype basso, duplicate or copy, formed by the electro-deposition on the alto of such a quantity of copper as to give the thickness of one-eighth of an inch, required for printing. The size of each of these plates is 42×38 inches, and the first electrotype copy taken has given 2,000 impressions, a number much exceeding what the original would afford.

23. The original plate, the electrotype alto, and an electrotype copy of the New York Harbor Chart. Scale $\frac{1}{80,000}$.

24. The original plate, the electrotype alto, and an electrotype copy of the Richmond's Island Harbor Chart.

25. Specimens of electrotype copper, showing its tenacity, flexibility, ring, and texture. By varying the battery and electrolytic conditions, the mechanical properties of copper can be greatly modified; thus the proper regulation of these actions is essential to the best results in casting plates.

[All the above specimens of electrotype plates were formed in the electrotype laboratory of the Coast Survey Office, under the charge of Mr. George Mathiol. The process is used to facilitate erasures of engraving, to extend plates, to subdivide urgent engravings on several plates subsequently joined, to insert views and engraved parts of plates, to deposit the silver battery plates, to heavy-gild deep-sea thermometers, &c., and for some other purposes. By its agency original plates are entirely preserved, and the impressions from the most elaborate ones are made cheap and perfect, without any reëngraving. For printing, the electrotype plates are decidedly superior to the planished originals, requiring less wiping and exhibiting less cloudiness, as the deposited copper is of the highest purity.]

D. *Charts and Maps.*

26. A large bound volume, containing mounted impressions of all the finished Coast Survey charts published up to July, 1853. These consist chiefly of harbor charts and of general coast charts, which, taken in connection, give the navigator all requisite information for sailing along the coast, and for entering its several harbors and rivers.

27. A large bound volume, containing mounted impressions of the principal triangulation sketches, preliminary surveys, lighthouse surveys, hydrographic reconnoissances, and topographical coast reconnoissances, which had been published by the Coast Survey up to July, 1853. These are quite numerous, and many of them embrace

actual hydrographic discoveries of much commercial importance. A great portion resulted from surveys in response to special calls by commercial and municipal bodies, to Treasury instructions, or to requisitions of special laws.

28. The maps and charts specified in the following list are all exhibited in frames or on rollers, some being colored, but most being plain:

Richmond's Island harbor, Maine.
Nantucket harbor, Massachusetts.
Harbor of Edgarton, Massachusetts.
Hyannis harbor, Massachusetts.
Harbors of Holmes' Hole and Tarpaulin Cove, Massachusetts.
Harbor of New Bedford, Massachusetts.
General coast chart from Gay Head to Cape Henlopen.

[This chart gives a large area of hydrography, extending about 300 miles out from New York. Scale $\frac{1}{100,000}$. Price, $1.00.]

Fisher's Island Sound,
Harbor of New London,
Harbor of New Haven,
Harbors of Black Rock and Bridgeport,
Huntington Bay,
Harbors of Sheffield and Cawkin's Islands,
Harbors of Captain's Island, East and West,
Harbor of Oyster or Syossel Bay,
Hart and City Island, and Sachem's Head harbor,
Hell Gate, New York,
} Long Island Sound.

New York bay and harbor, and the environs. Scale $\frac{1}{80,000}$. In six sheets. Price, $1.50. This impression is colored and mounted on rollers; size, 63×66 inches.

New York bay and harbor, and the environs. Scale $\frac{1}{80,000}$. In one sheet. Price, 75 cents. Size, 25×36 inches. This specimen is colored.

Western part of surveyed coast of Long Island, New York. Scale, $\frac{1}{80,000}$.

Little Egg harbor, New Jersey.

Delaware bay and river. Scale $\frac{1}{80,000}$. In three sheets. Price, $1.20. This specimen is mounted on rollers.

Mouth of Chester river, Chesapeake bay.
Harbor of Annapolis and Severn river, Maryland.
Pasquotank river, Albemarle Sound.
Mobile bay entrance, Alabama.
Cat and Ship islands and harbors, Mississippi Sound.
West coast reconnoissance from San Francisco to San Diego, California.
San Diego bay and approaches, California.
Trinidad bay, California.
Humboldt bay, California.
Catalina harbor, California.
Monterey harbor, California.
Mouth of Columbia river, Oregon.

[The principal portion of the above harbor charts are on single sheets, 14×17 inches, scales from $\frac{1}{20,000}$ to $\frac{1}{80,000}$, and price 15 cents: though quite a number vary irregularly from this description.]

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2. Office of Weights and Measures of the Treasury Department of the United States, *Washington, District of Columbia.*—Proprietor. (Professor A. D. Bache, *Superintendent of Weights and Measures.*—Exhibitor.)

The following United States standards were made in the Office at Washington, as directed by the existing United States laws on standards for Mints, Custom Houses, and other federal uses, and also for presentation by sets to each State in the Union. [See C. P. Record, p. 117.]

1. A United States standard yard, in two bars; one giving a yard by end measure, and the other giving a traced yard, which is divided into feet, one foot into inches, and one inch into tenths; also, on another scale, the yard is divided into tenths, and one tenth into hundredths. The standard temperature is 62° Fahrenheit.

2. A United States standard set of brass liquid capacity measures, with their striking glasses, including a gallon, a half gallon, a quart, a pint, and a half pint.

3. A United States standard half bushel of dry measure, made of brass, with its glass striking plate.

4. A set of United States standard avoirdupois weights, including the following: 50 lbs., 25 lbs., 20 lbs., 10 lbs., 5 lbs., 4 lbs., 3 lbs., 2 lbs., 1 lb.; also a standard troy pound.

5. The following multiples and submultiples of the avoirdupois ounce: 8, 4, 2, and 1 ounces; 5, 4, 3, 2, and 1 tenths; 5, 4, 3, 2, and 1 hundredths; 5, 4, 3, 2, and 1 thousandths; and 5, 4, 3, 2, and 1 ten-thousandths. The small weights are made by bending wire into 1, 2, 3, 4, 5-sided forms.

6. The following troy ounce multiples and submultiples: 10, 6, 5, 4, 3, 2, and 1 ounces; 5, 4, 3, 2, and 1 tenths; 5, 4, 3, 2, and 1 hundredths; 5, 4, 3, 2, and 1 thousandths; 5, 4, 3, 2, and 1 ten-thousandths.

7. A large-sized office comparing balance, arranged according to the new model, being essentially that of the large new Mint balance, except that both scales are arranged for weights. It is intended to be used with weights up to 50 lbs. on each scale. With this load, when in good adjustment, this balance indicates one-fiftieth of a grain, or one-thirty-five-millionth of the double load. Somewhat larger loads can be safely weighed on it if necessary.

8. A large-sized balance, of the old model, for weighing up to 50 lbs. on each scale.

9. A medium-sized balance for weights up to 10 lbs. on each scale, with which load it indicates one-hundredth of a grain, or one-fourteen-millionth of the double load.

10. A small-sized balance for weights up to one pound on each scale, with which load it indicates, when in perfect order, one-thousandth of a grain, or one-fourteen-millionth of the double load.

French Standard Weights and Measures.

A full set of the standard weights and measures of France was presented to the United States Government in 1852, (through M. A. Vatemare,) in exchange for a standard set of United States weights, measures, and balances, previously presented to France. The following articles, selected from the French donation, are exhibited:

11. A standard steel metre, prepared and carefully verified by M. Silbermann, in a manner of his designing, first used in this instance. This metre is of very high authority.

12. A standard litre and kilogramme, prepared and verified by Gambey. The workmanship is of a high order.

13. A set of the French capacity measures, from the double decalitre down to the centilitre, with their glass striking plates.

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3. Lighthouse Board of the Treasury Department of the United States, *Washington, District of Columbia.*—Proprietor.

Revolving and flashing fresnel light, of the first order, manufactured by Lepaute, of Paris, and imported by the United States Government for the lighthouse at Cape Hatteras. This beautiful apparatus is placed in the South Nave. [For a description and figures of this apparatus, see the Record, page 145.]

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4. Richards, John B., *New York City.*—Proprietor.

House's electro-magnetic printing telegraph, in operation between two offices, one in the north and the other in the south end of the building. [For a description of the electric telegraph, and figures of House's and Morse's apparatus, see the Record, page 105.]

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5. Batchelder, John M., *Boston, Massachusetts.*—Inventor.

Electric telegraph register; various kinds of telegraph insulators.

5a. Barlow, Thomas H., *Lexington, Kentucky.*—Inventor.

Planetarium, of an entire new construction, including the earth and its satellite, and the planets between it and the sun; showing the actual motions of the Sun, Mercury, Venus, Earth, and Moon, with the phases of the planets, changes of the seasons, and other astronomical phenomena.

[Perhaps no more striking account of a planetarium, considered from a scientific point of view, can be given than is presented in the following paragraph, by Sir John Herschel:

"Choose any well-leveled field or bowling-green. On it place a globe, two feet in diameter; this will represent the Sun: Mercury will be represented by a grain of mustard-seed, on the circumference of a circle 164 feet in diameter, for its orbit; Venus, a pea, on a circle 284 feet in diameter; the Earth also a pea, on a circle of 430 feet; Mars a rather large pin's head, on a circle of 654 feet; Juno, Ceres, Vesta, and Pallas, grains of sand, in orbits of from 1,000 to 1,200 feet; Jupiter a moderate-sized orange, in a circle nearly half a mile across; Saturn a small orange, on a circle of four-fifths of a mile; and Uranus a full-sized cherry, or a small plum, upon the circumference of a circle more than a mile and a half in diameter. As to getting correct notions on this subject by drawing circles on paper, or, still worse, from those very childish toys called orreries, it is out of the question. To imitate the motions of the planets, in the above-named orbits, Mercury must describe its own diameter in 41 seconds; Venus, in 4 minutes 14 seconds; the earth in 7 minutes; Mars, in 4 minutes 48 seconds; Jupiter, in 2 hours 56 minutes; Saturn, in 3 hours 13 minutes; and Uranus in 2 hours 16 minutes."

In another point of view some merit may be claimed for a planetarium. As an aid in giving a wide conception of the solar system, and of the planetary movements, it may be made of service and convenience; though, for minds capable of conceiving astronomical facts abstractedly, all such machinery is an ultimate hindrance, as it tends to suppress that mental effort which alone gives true insight. The case is, in some respects, like that of geological sections, in which a horizontal scale much less than the vertical is employed; a step indispensable for the presentation of geological relations, but often misleading theorists, who are prone to forget that two scales are used. Astronomy needs no such scaffolding, nor do real astronomers employ orreries or any other material fictions; but there will probably be always men who, being destitute of the power of abstraction, will indulge in mechanical devices to represent the sublime realities of our planetary system. Such productions belong rather to the department of mechanical puzzles, than to science or philosophy.]

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6. Riker, J. L. & D. J., *New York City.*—Manufacturers.

An orrery, moved by hand, exhibiting eight planets with their satellites, and the asteroids. The spindle which supports them has a diagram of the zodiacal signs; from this, iron arms extend at the equinoctial or solstitial points; to these arms is attached a wire hoop, to which is hung a blue curtain, on which the signs of the zodiac are represented, a line through them representing the path of the sun. Each planet can be brought to any particular point of its orbit, so that its phases and movements in respect to the earth and sun may be observed. The earth, being on an inclined axis, may be made to keep its polarity so as to illustrate the seasons. The solar and lunar eclipse, and the rising of the morning and evening stars, may also be illustrated.

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7. Copley, Charles, *Brooklyn, New York.*—Manufacturer.

Sixteen-inch terrestrial and celestial globes, containing the most recent discoveries in geography and astronomy.

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8. Swain, William M., President of Morse's Magnetic Telegraph Company.

Morse's patent electric telegraph apparatus, in operation, and the wires in direct connection with the principal lines in the United States.

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9. Dusenberry, William C., *New York.*—Manufacturer.

Portable illuminator, under the patent of the United States Gas Company.

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10. Mallard & Napier, *Brooklyn, New York.*—Inventors and Manufacturers.

Self-regulating and anti-corrosive gas-burners.

[When the supply of gas is partially cut off at the gas-works, the flame of the burners falls; or when a number of lights are turned off, those which still burn have their flame increased. It is the object of self-regulating burners to obviate this inequality by a contrivance which adapts the flame to all variations of pressure, preventing it from rising above or falling below any height to which they may be adjusted.]

11. Grunow, Brothers, *Brooklyn, New York.*—Manufacturers.
Achromatic microscopes, single and compound, of four different constructions.

12. Peters, Otis F., *New York City.*—Inventor.
Improved stereoscope.

13. Foote, Edward, *Jersey City, New Jersey.*—Inventor and Manufacturer.
Micrometro-chemical balance, exhibited for simplicity of construction. It will weigh from the one-thousandth of a grain to two ounces; from its simplicity it is less easily disarranged and cheaper than the chemical balance.

14. Barfenberg, John, *New York.*—Manufacturer.
Chemical balance and weights, exceedingly delicate, and wrought in palladium. The axis and layers are of agate. It will show a weight of one-thousandth part of a gramme, at a charge of ten grammes.

[Balances have been made in Prussia, which will turn with about the millionth part of the extreme weight which they can weigh. A balance, made by Ramsden for the Royal Society of London, which was capable of weighing ten pounds, would turn with one-hundredth of a grain, or the seven-millionth part of the extreme weight. Such delicate instruments must, of course, be inclosed under glass.]

15. Kissam, James A., *New York City.*—Manufacturer.
Balances for druggists and for weighing gold; standard weights and measures.

16. Myers, Frederic R., & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Bank gold scales, with set of weights.

17. Farmer, Moses G., *Boston, Massachusetts.*—Inventor.
Electro-magnetic telegraph battery.

18. Deane, A., *New York City.*—Manufacturer.
Telescopes, spy-glasses, and opera-glasses, of various descriptions; microscope.

19. Waldstein, H., *New York City.*—Manufacturer.
Various optical and mathematical instruments.

20. Fitz, Henry, *New York City.*—Inventor and Manufacturer.
A chromatic telescope, equatorially mounted in cast-iron, with detached tangent screw. This instrument is adapted to equatorial, altitude, and azimuth observations; the circles of declination and right ascension are four inches in diameter, divided to degrees in arc, the former reading with two, and the latter with one vernier. It is 4¼ inches aperture, 6 feet long; with an improved equatorial mounting, by which it is adapted to slow motion by tangent screw, or free motion by hand, without clamping or unclamping; this prevents injury to clamping screws, by trying to turn the instrument without unclamping tangent screw.

[The prismatic elements of a beam of white light, having different refractive indices, the effect of their refraction by a spherical surface is to converge each color of the light from a radiant point into a focus by itself. Thus the chromatic parts of a white beam or pencil from an object or radiant on the axis of a lens, are so refracted by the lens as to produce along the axis a series of colored images of the radiant, the violet image being nearest the lens, and the red the most remote. The effect is to produce in telescopes, with simple object glasses, a confusion of colored images quite incompatible with distinct vision. The object of achromatic combinations is to correct this defect and to secure the coincidence of all images of each point in the field. All reflecting telescopes are achromatic of course, though subject to the same spherical aberration as the refracting lenses.

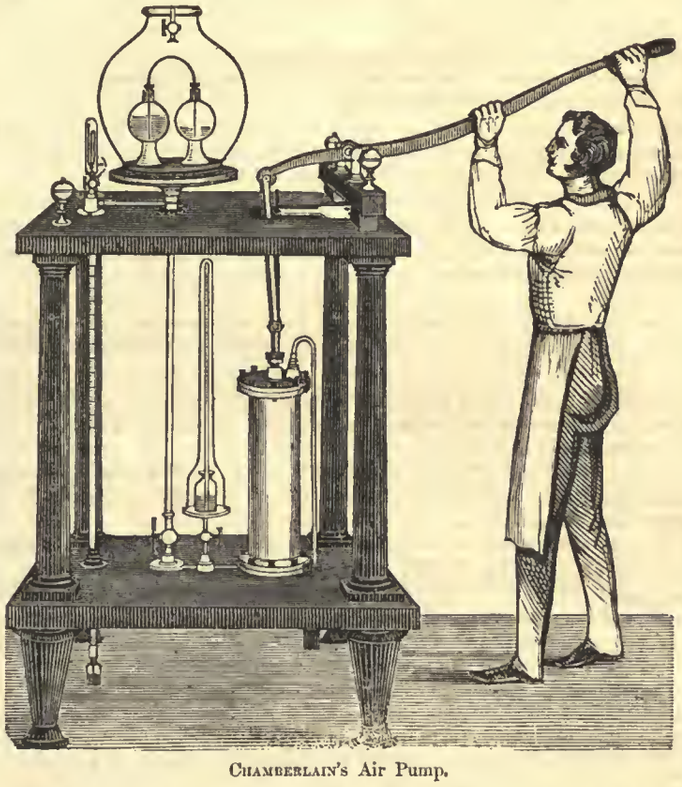
Newton pronounced a combination of achromatic lenses an impossible thing, but for once he was wholly mistaken. Euler, led by the analogy of the human eye, argued the practicability of achromatism, and in 1773, Mr. Hall of Essex made, in obscurity and without publication, various combinations of this kind; and again, Dolland, in 1758, independently achieved the same. The history of achromatic telescopes, in which the object-glasses are compounded of flint and crown glass, is closely identified with that of the general art of glass working. The most perfect purity and homogeneousness are essential to achromatic object-glasses, and both flint and crown glass must be worked with the highest skill to obtain large pieces, free from flaws, specks, or threads, and of uniform density throughout. The British excise-tax long drove this branch of manufacture out of England by its excess and its outrageous penalties. Fortunately for science, Guinand of Brenetz, in Switzerland, took up this art with a genius and perseverance capable of triumphing over all obstacles. Fraunenhofer, of Munich, engaged the coöperation of Guinand, transferred him to Munich, and by his own science and application wrought out a vast accession to the perfection and powers of the refracting telescope. Fraunenhofer's untimely death left much of his work incomplete, but the impulse given by his genius was not lost on his successors. The maximum size of achromatic telescopes has been steadily increasing, and Messrs. Merz & Mahler of Munich completed, a few years since, two very perfect achromatic equatorials of fifteen inches effective aperture. One of these is mounted at Pulkova, under the charge of Struve, and the other, purchased chiefly by Boston merchants, is mounted at Cambridge, under charge of Professor Bond. Both have rendered effective service to astronomy already. Professor Bond's fine discovery of Saturn's third ring was due to the high power and optical excellence of the great Cambridge equatorial.

The last marvel among achromatic telescopes, is one erected on Wandsworth Common, England, for the Rev. Mr. Craig, by Mr. Gravatt. This has a twenty-four inch achromatic object-glass, of which the flint glass was furnished by Mr. Chance of Birmingham, and the plate glass by the Thames Plate Glass Company. It is stated, after limited trials, to be very perfect in its achromatism and in its defining powers generally, though more experience will be requisite to prove its character entirely. Its space penetrating, resolving, and defining powers are very high, and if it is thoroughly correct in the figure and combination of its lenses, it must be more powerful than any other telescope. This is a first consequence of the repeal of those fatal glass taxes which, through many years, made it impossible for English artists to produce any thing of value in this department.

The refracting telescope is of the highest importance to astronomy, not only for these large equatorials, but for transit, mural circle-telescopes, and other like cases, in which graduated circles are read to determine astronomical positions. Being lighter and simpler than reflecting telescopes of equal power, and producing less loss of light, they will usually deserve the decided preference when the cost of their construction is not too great. Thus both, in the ordinary fields of astronomical labor, and in that grander one, wherein the resolution of nebulæ, of double stars, of all that is knowable in stellar astronomy, engrosses the astronomer's energies; throughout all the unfolded and unfolding domains of astronomical research, there is still ample need of progressive improvement in the construction of achromatic telescopes, in the increase of their power, and in the economy of their production. The time may be near when some American will do for the refracting telescope what Spencer has already done for the microscope.]

21. Pike, Benjamin, Jr., *New York.*—Manufacturer.
Air-pump and pneumatic instruments; plate electrical machine, with the cushions at upper and lower portions, finely mounted on rosewood stand; magnetical and electrical apparatus.

22. Chamberlain & Ritchie, *Boston, Massachusetts.*—Manufacturers.
American lever air-pump; very complete and beautifully finished, mounted on rosewood.



Chamberlain's Air Pump.

[The barrel of the above instrument is 13 by 4¼ inches; the piston is half an inch thick. It has three valves—on base-plate, on piston, and on cylinder-head; the plate is 15 inches in diameter; the barometer-gauge is 34 inches long, and is furnished with a guard at the top. The general form is an improvement of that constructed by Leslie It is simple and effective, combining power, convenient form, durability, and beauty. The improvements claimed, which originated with N. B. Chamberlain, and which have been almost universally copied by others, are as follows:—

In the construction of the piston, it occupies but one-twenty-sixth of the barrel; it is cup-formed and elastic, and packed with a single piece of prepared leather. The depth of contact is less than one-eighth of an inch on the barrel; the friction is thus almost removed, while the edge of contact with the sides of the cylinder is perfect.

In the upper and most important valve, which is a simple clapper-valve, and in the mode of securing it. It is placed under a dome-cap in the cylinder-head; it is free and quick in action, always in place, and readily removed and replaced; it closes over four holes, thus avoiding the *pneumatic paradox.* In the piston-valve, which is a light disc, held in place by the piston-rod, working by its own inertia.

The first close-barrel lever-pump made in this country was by Mr. Chamberlain, for Harvard College, Cambridge, Massachusetts, in March, 1839; this is now in use, and has the above improvements.

It is worthy of notice that this pump is put together with metallic joints, without

"washers:" the barrel was planed out longitudinally. It is a duplicate of one made for the Smithsonian Institution, and now in use there. Its working capabilities are to one-twentieth of an inch mercury gauge, or to five hundred and ninety-nine 600ths of a vacuum, freezing water by its own evaporation, &c.]

23. Belcher, William, 221 *Pearl Street, New York.*—Agent.
Scales and rules for mechanics, architects, surveyors, &c., in box-wood and ivory.

24. Adams & Tagliabue, *New York.*—Manufacturers.
Barometers and thermometers, in various styles; glass hydrometers for spirit, beer, oil, and acids; hydrostatic gold test.

[The barometer has two chief uses. 1st. As an instrument for determining differences of height; and 2d. As an indicator of atmospheric changes. It has also two principal forms, both of which are widely used, namely, the mercurial and the aneroid barometers.

The mercurial barometer, first applied to the measurement of heights by the celebrated Pascal, is simply a column of mercury, whose weight is hydrostatically an exact counterpoising measure of the atmospheric pressure, or of the weight of the vertical air column above the instrument. The weights of the atmospheric columns at two adjacent stations differing only by the weight of a vertical column between their respective levels, we have simply to connect the variation of height with that of the pressure by the proper law in order to determine the difference of station elevations. This law of atmospheric pressure, or density, is involved in the form required for use in the following formation:

$$Z = 60345 \text{ ft. } [1 + ,001042\ (t + t' - 64)]\ (1 + ,002837,\ \text{Cos. } 2\psi) \times (\text{Log. } h' - \text{Log. } h - ,000044\theta)$$

in which Z is the difference of height between the two stations occupied; t and t' the Fahrenheit temperature of the air in the shade at the upper and lower place during the barometer readings; ψ is the latitude; h the height in inches of the barometric column at the higher station, and h' the same at the lower; and θ is the difference of readings of the attached thermometers, indicating the temperature of the mercury. Simultaneous observations by two observers are desirable when practicable, or otherwise observations at one station should be made at equal times before and after that at the other. Long continued reading at a station may be reduced and averaged for comparison with the ocean surface or other standard level.

The aneroid barometer is graduated on an arc of its face, in divisions corresponding to the mercurial scale. This instrument is of recent origin, but is now widely used as an indicator of weather-changes. Its range is rather limited, and its operation is not reliable beyond the ordinary changes of height. Its principle is that of measuring the varying extent of collapse of the flexible end of a case inclosing a vacuum. The case is of corrugated metal, and the broad yielding end communicates its slight variations or motions to a spring; this motion is then geared up and conveyed to an index-hand on the face. Its compact portable character gives a great advantage to this over the mercurial barometer, were it not that its indications are less certain and too restricted in range for a mountain barometer. They have usually been made quite rudely in the essential parts, and it is probable that improved fabrication might overcome some of the defects to which the common forms are found to be liable. But they can never become trustworthy standards, or replace the direct mercurial column for the most refined observations.

The extensive meteorological crusade which, for almost twenty years, has been progressing with varying zeal on both continents, has served to direct a large amount of attention to the details of barometric construction. The principle of the mercurial barometer involves only the existence of a perfect vacuum, and the arrangements requisite for measuring in standard inches the vertical distance between the mercurial level in vacuo and that in the communicating open fountain or cistern; this principle is of such simplicity as to admit of barometric improvements only by directing care to the materials and workmanship through which it is expressed. There is abundant need of this care, for there is almost no end to the barometric observations which are well nigh valueless through faults in the configuration, materials, and workmanship of the instruments used. Unfortunately the scale of a mercurial barometer gives but limited changes of reading for ordinary atmospheric changes, hence great accuracy is requisite in all parts of the construction and in the readings when it is proposed to measure such elements as the diurnal barometric wave.

Another rather singular and ingenious barometer of the aneroid species, and not much in use, is worthy of mention here. M. Bourdon of France has availed himself of the fact, that a tube bent into a circular arc, and exhausted of air, coils and uncoils, or changes its curvature with the external pressure, to obtain a measure of that pressure. Thus the opposite ends approximate or recede along a scale constructed by means of a mercurial barometer, and so indicate the pressure. This form of construction is free from the objections incident to the machinery for magnifying the motion in the ordinary aneroid.]

25. Blake, William Phipps, *New York.*—Inventor and Proprietor.
Reflective goniometer and polariscope, for measuring the angles of crystals and the inclination of the optic axes. Made to order by Duboscq-Soleil, of Paris, from drawings by the exhibitor.

26. Lewis, William & William H., *New York.*—Manufacturers.
Improved coating-box for the daguerreotype process. Its advantages are, first, the friction is taken off the edge of the pot, and the upper and under-side of the slide, which prevents them from wear, thereby always keeping a tight pot when once made tight; second, the slide can be passed over the pot with great rapidity, which prevents the plate from becoming coated more on one side than the other; third, the pots are longer and wider (for the same size plate) than any made before, so that the largest plate the slide will admit can be coated at the outer edges equal to the center; fourth, the chemicals can be kept at any required temperature at any season of the year.
Card-distributing apparatus. (Patents applied for.)

27. Isenring, John, *New York.*—Inventor.
Electro-magnetic conductor and storm indicator. This apparatus is put in connection with a lightning-rod, and will indicate a storm three to seven hours in advance.

28. Vale, G., *Bowery, New York.*—Patentee.
Globe and sphere, combining celestial and terrestrial globe; the terrestrial turns within the celestial. Problems in the real and apparent astronomy are performed in imitation of nature. The globe and sphere combines astronomy with geography and spherical trigonometry; it is a perfect sun-dial for all places, and can be used as a planetarium.

29. Roosevelt, Clinton, *New York.*—Inventor and Proprietor.
Pantechna, or master of various arts.

30. Finn & Baker, *New York.*—Manufacturer.
Mathematical scales and protractors, in ivory, box-wood, ebony, and metal, for all kinds of drawing and mapping. Some of these measures are graduated as fine as 200 divisions to the inch.

31. Warring, C. B., *Poughkeepsie, New York.*—Manufacturer.
Various philosophical instruments, to illustrate statics and dynamics; the inclined plane, the lever, the composition of forces; stability apparatus, and the transmission of forces and motion.

32. Alt, Charles, *New York.*—Manufacturer.
Optical instruments, lorgnettes, &c.

33. Prentice, James, *New York.*—Manufacturer and Importer.
Specimens of mathematical instruments.

[The successful practice of mathematical, mechanical, and engineering drawing, depends, to no small extent, on the character of the instruments used. The principle which should prevail, in respect to drawing instruments, is, to limit the varieties employed to the smallest number adequate for the purpose in hand, and to make each instrument with the utmost precision, simplicity, lightness, and solidity of workmanship. There are very few cases of instruments not containing some pieces which even long practice of drawing will fail to bring into effectual requisition. Good steel rulers and triangles; right-line pens with even, fine points, one of which opens out for cleaning; even, sharp, round-pointed dividers, of two or three sizes; two sizes of pencil and pen compasses, a protractor, and a good magazine-scale, will be found sufficient for most purposes of drawing. It may be requisite to add the beam-compass for laying down long distances, and proportional-compasses for passing from one scale of drawing to another. The use of reducing-squares, the *camera lucida*, or the pentagraph, will be requisite when considerable reducing of irregular drawing is to be executed.

The pencils, ink, colors, brushes, color and ink cups used, are worth much consideration, as they greatly influence the facility and pleasantness of drawing. Fine hard (H.H.H.) pencils, sharpened, one to a round and one to a flat point, with pumice-stone or fine sand-paper, on which to renew the point, are among the first essentials to good drawing. A clean-working right-line pen, capable of ruling from the finest to the coarsest gauge of lines, and easy in the fingers, is the next essential, and one which needs to be seconded by good India-ink. By rubbing this ink well, and keeping the liquid ink covered, only opening it for dipping, its drying is obviated, while dust and fibers are prevented from mixing in it, and thus the ink of one rubbing may be made to answer for several days, saving the hand from the tremulousness caused by rubbing the ink daily. If the India-ink cake is very hard, a gentle warming of the cup makes it dissolve more readily, but too high a heat injures the ink. In using water-colors, a good assortment of flat and pointed brushes is needed, and all washes should be made in such quantity as to permit dipping with the brush without disturbing the sediment. Brushes should always be well cleaned and laid, or pointed after use.

Few drawing articles are more difficult to obtain in the requisite perfection than scales, the graduation being generally either incorrect or inconvenient. A good quality of paper scales is now made cheaply, and in considerable variety of subdivision. These vary with drawing-paper pretty nearly during hygrometric changes. Ivory or wooden-edge scales are, on the whole, most convenient, but for miscellaneous drawing the requisite variety is quite expensive.

In practicing drawing, it is an advantageous plan to use, by preference, the few simple instruments necessary in elementary constructions, always reducing more complex problems to their elements, and using computed rather than protracted quantities, when they are readily obtained. This course produces an independence of elaborate instruments which is often highly convenient, and, in the end, it insures the greatest facility.]

34. Hoffman, Louis C., *New York.*—Manufacturer.
Hydrostatic instruments; graduated specific gravity jars, tubes, measures, and chemical thermometers.

35. Fehrens & Albrecht, *New York.*—Manufacturers.
A variety of mathematical instruments.

36. Amsler, Charles T., *Philadelphia, Pennsylvania.*—Manufacturer.
Elliptical compass, for drawing ovals of any curve.

37. Doughty, Samuel H., *New York.*—Manufacturer and Proprietor.
Parmlee's computing-scales, for adding and testing the addition of long columns of numbers.

38. Fleischel, Charles.—Inventor and Manufacturer.
Galvano-electric and bell-alarm clocks, of novel and curious construction.

39. Cambel, Jno. R., *Weehawken, New Jersey.*—Manufacturer.
Chronometer and fine watch; diamond points for bank-note engraving, worked in the axis of crystallization, and warranted to stand.

40. Mary Gray, P. L. D., *New York.*—Manufacturers.
Marine chronometers, with improved escapement, highly finished.

[An escapement is a mechanical contrivance for transmission, at equal intervals, of the maintaining power to the regulator; its office being to allow a tooth of the wheel to escape, or pass onward, at such intervals of time as are measured by the regulator.]

41. Burnet, Joseph, & Co., *New York.*—Manufacturers.
New style of bronzed clocks, vases, and ornaments.

42. Crane, Aaron D., *Newark, New Jersey.*—Patentee and Manufacturer.
Patent year-clock, with torsion pendulum. Astronomical year-clock, showing the day of the month, time of rising and setting of the sun and moon, and other astronomical periods; as when the sun and moon enter the signs, the phases of the moon, high and low tides: it can be set to any latitude below 60 degrees; it compensates for difference of motive power and temperature, and will run 376 days without winding.

43. Trott, Stanley G., *New London, Connecticut.*—Part Proprietor.
Abbott's apparatus for showing apparent time at sea, from an altitude or a star, without logarithms. Abbott's geological chart.

[Abbott's horometer belongs to the highly important and useful class of inventions which are intended to give increased certainty and facility to navigation. It presents a graphic or mechanical method of rapidly solving several of the principal practical problems of frequent recurrence at sea, the solutions being as accurate as is requisite in ordinary cases. It should not supersede calculations when time permits the making of them, but it is a very trustworthy check in numerical errors, and, in many cases, it can be used with such facility as to make useful observations, which otherwise the time and labor of computation would prevent from being used at all, or in the right time. It, moreover, enables the navigator to obtain a more intelligent conception of the quantities with which he is dealing in his observations.

Mechanical or graphic methods are rarely as good as strict computations, but in some cases, among which should probably be included the horometer solutions of nautical problems, the results possess all the requisite accuracy, and the facility with which they are obtained justly commends the mechanical method for extensive practical adoption. It is really desirable that this instrument should make part of the outfit for all ocean vessels: nor can it reasonably be doubted that its general adoption would afford an additional safeguard against those errors of position which so often involve the safety of vessels, crews, and passengers.]

44. Terry, T., President of the Ansonia Clock Company, *Ansonia, Connecticut.*—Manufacturers.
Plain and ornamental marine and pendulum-clocks, and time-pieces, of superior construction.

45. Sherry & Bryam, *Sag Harbor, New York.*—Manufacturers.
Turret or steeple-clock, ornamented; a variety of time-pieces; new pendulum.

46. Leconte, Adolphe, *New York.*—Manufacturer.
Specimens of bronze and electro-plated clocks. Statuettes, in metal.

47. Jerome, A. S., *New York.*—Manufacturer.
Eight-day clocks of various descriptions; thirty-hour clocks.

[He also exhibits an antique clock, made in 1509, in an oak case, whose rude carvings contrast strangely with the ornamented clocks of the present day.]

48. Sperry, Henry, & Co., *New York.*—Manufacturers.
Clocks and time-pieces of various descriptions.

49. Litchfield Manufacturing Company, *Litchfield, Connecticut.*—Manufacturers.
Various styles of clocks, with brass movements, in papier-maché cases.

50. Sotis, Frederic, *Forestville, Connecticut.*—Manufacturer.
Variety of ornamental clocks.

51. Billon, Louis, *New York.*—Manufacturer.
Watch which goes nine days, showing the hours, days of the week and month, the months and years.

52. Taylor, E., & Co., *Rochester, New York.*—Manufacturers.
Barometers and thermometers.

53. Shea, Roland H., *New York.*—Manufacturer.
Mathematical instruments; leveling and transit instruments; surveyors' compasses.

54. Murray, Alexander, M. D., 157 *West Sixteenth Street, New York City.*—Manufacturer.
Microscopic objects, mounted upon slips of glass, illustrating comparative anatomy, botany, chemistry, entomology, geology, and zoology.

54a. Burnett, W. J., M. D.—*Boston, Massachusetts.*—Proprietor.
Microscopes and microscopic specimens.

55. Kline, Samanos & Co., *New York.*—Manufacturers.
Marine chronometers, highly finished.

56. Negus, Thomas S., & Co., *New York.*—Manufacturers.
Large marine chronometers, highly finished.

56a. Durkee, Silas, M. D., 27 *Howard Street, Boston, Massachusetts.*—Manufacturer
A collection of one hundred and seventy specimens of microscopic anatomy, beautifully mounted, and arranged in mahogany cases.

The specimens are mounted on glass slides, one inch wide and three inches long. They are secured in glass cells, with twin covers cemented to the cells; some of them are mounted dry, others in fluid. They are designed to represent the minute anatomical structure of the different organs and tissues of the human system.

They consist of the following specimens:

1. *Epidermis*, or cuticle, of fœtus, showing the sudoriferous tubes on its under surface. Some of these tubes, the excretory ducts of sudoriferous glands, which separate the sweat from the blood, may be seen outside of the margin of the specimen, and can be examined advantageously with a power of from 40 to 80 diameters.

2. Individual *Epidermic scales*, requiring a power of from 70 to 150 diameters.

3 *Epidermis* of the *scrotum* of the negro, showing the pigment or color-secreting cells; requiring about 300 diameters.

4, 5, 6. Vertical sections of the skin of the *heel*, showing the *sudoriferous tubes* detached from the dermis, or true skin. Some are seen (as in No. 6) passing through the dermis and terminating at the base of the papillæ. The papillæ are seen naked; 20 or 30 diameters required.

7. *Cuticle* from *dorsal surface* of *fore-finger* of an adult female, showing the perforations of the papillæ.

8. *Skin of palm of the hand* of an adult male, injected, and showing, especially on the left of the field, several rows of loop-like capillaries, corresponding to the rows of papillæ. The papillæ are little conical projections on the external surface of the dermis and in contact with the cuticle, to which they give a furrowed appearance; they are composed of a fine net-work of vessels and nerves, and their size and number, in part, are proportioned to the acuteness of its sense of touch.

9. *Skin of back of hand* of the same subject, showing the reticulated distribution of its vessels. The cuticle is removed in the last two specimens. A very fine specimen.

10, 11. Transverse sections of the *thumb nail*, showing its laminated structure, and the mode of its connection with the papillary layer of the subjacent integument by mutually interlocking processes; thus making an exceedingly firm union—what is called by carpenters "dovetailing."

12. Transverse section of *integument* beneath the thumb nail, injected; it may be examined both by transmitted and direct light. Some of the twisted loopings of the blood-vessels are well seen with about 30 diameters.

13. Longitudinal view of the same, injected. In separating the specimen from its attachment to the bone, some of the vessels were thrown out of their normal arrangement, as may be seen, especially on the left.

14. The same injected. This specimen was taken near the root or matrix of the nail, and shows the vessels very satisfactorily. The nails are analogous to the claws and hoofs of the lower animals; the root, or posterior edge, and the sides, are received into an elliptical groove in the dermis, and are partly covered by the cuticle. The nails are non-vascular and insensible, like the epidermis and hair.

15. *Epididymis.* This is an elongated, flattened body, situated along the posterior body of the testicle; its structure is essentially the same as that of the body of the testicle, consisting of an assemblage of minute tubes, finally uniting to form a single canal, afterwards becoming the vasdefereus.

16. Upper portion of *œsophagus*, injected.

17, 18. *Pancreas*, injected.

19. *Mesenteric glands* of fœtus, injected.

20 to 28. Represent the development of the *teeth*, from the sac of a fœtal tooth of three months to that of an aged person. In the large tricuspid (No. 27) the stellate lacunæ are very abundant; and in the longest fang, a little distant from its extremity, the lamellated bone structure is well defined; the cementum along the inner border of the fangs is remarkably thick. The dentine tubes are large, and their curved direction in the crown may be seen with the naked eye, by holding the specimen up to the light. The tooth has two cavities, each containing a pallet of gold—a cavity just at the union of the crown with the longest fang, may also be seen in the specimen. The primitive dental papillæ are formed in grooves on the surface of the mucous membrane; these become inclosed in follicles which shut over them: the tooth afterwards bursts forth from the inclosing capsule, generally between the fifth and seventh month of life (for the first teeth), the summit of the tooth being carried upwards by the growth of its root. The hard part of a tooth consists of three substances—*dentine*, *enamel*, and *cementum*. The *dentine*, or *ivory*, is formed by the calcification of the dental pulp; it constitutes by far the greatest portion of the tooth, being covered externally by the enamel and cementum; it is harder than bone, destitute of blood-vessels and nerves, and penetrated by a very great number of minute tubes, commencing by open mouths on the walls of the internal cavity, and passing in an undulating direction to the external surface, often bifurcating. The *enamel*, the hardest part of the tooth, is made up of long prismatic fibers of hexagonal form, looking on transverse section like a mosaic pavement; in man it covers the crown of the tooth only; this, though the hardest substance in the body, is extremely brittle. The *cementum*, *crusta petrosa*, or *cortical substance*, has the characters of true bone, possessing its distinctive stellate lacunæ and radiating canaliculi; it forms a thin layer, which envelops the root of the tooth, commencing near the termination of the cap of enamel; it is this part which so often becomes thickened on the fangs of the teeth, rendering extraction difficult.

29 to 40. Illustrates the structure and development of *cartilage* and *bone* in the various stages, from the cartilage cells of the fœtal femur of six weeks to the adult.

No. 34 is a portion of the outer condyle of the adult femur, showing, among other things, ultimate bone granules. No. 38, if examined with about 270 diameters, displays the laminated structure very satisfactorily; it is a transverse section of an adult numerus. In No. 40, which is a longitudinal portion of the femur, a transverse section of many of the canaliculi can be seen; as thus examined they seem to be about one-third the size of ordinary dentine tubes. On microscopic examination of a thin lamella of bone, in the midst of an apparently homogeneous substance, are seen dark spots with numerous very minute radiating prolongations; these spots, formerly called *Purkinjean corpuscles*, from the name of their discoverer, are now known as *bone cells*, or *lacunæ*, and are highly characteristic of true bone structure; they are open spaces, and the minute prolongations, or *canaliculi*, are delicate tubes; the *Haversian canals*, surrounded by concentric laminæ of bone, serve for the transmission of bloodvessels into the osseous substance; they vary in diameter from $\frac{1}{2500}$th to $\frac{1}{200}$th of an inch, the average being about $\frac{1}{300}$th of an inch. The development of bone is commonly preceded by a cartilaginous structure, which occupies the place the bone is afterwards to take; bone is not, however, formed by the ossification of cartilage, the process of bone formation, according to Carpenter, always commencing in the neighborhood of blood-vessels, which pass down in canals excavated in the cartilage, forming *centers of ossification;* the cartilage cells degenerate and die, and in the spaces thus left a formative blastema, containing cells, is formed from the neighboring vessels; this is gradually consolidated into fibrous tissue, which subsequently becomes calcified, the interspersed cells being changed into lacunæ and canaliculi.

41. *Papillæ of under lip*, injected; this may be examined by direct or transmitted light, with a power of 20 to 30 diameters. By turning the specimen upside down, and examining it by transmitted light, a few mucous glands are seen.

42. *Papillæ of upper lip*, injected.

43, 44, 45. Different portions of the *gall-bladder*, injected. Very fine.

46 to 51. Different views of the *kidney*, including the corpora Malpighiana, with their afferent and efferent vessels; the vessels that accompany the uriniferous tubes; and the stellate appearance of the vessels on its surface. No. 50, a fœtal preparation, shows the latter. *Corpora Malpighiana* are knots of minute bloodvessels, formed by the convolutions of delicate capillaries, included in little flask-shaped capsules, the necks of which are continuous with the uriniferous tubes; they appear like little dark points, studding the cortical or external substance of the kidney. (Fine preparation.)

52 to 55. Injected specimens of the *liver*, showing the *acini*, a portion of the *portal circulation*, vascularity of the serous coat, &c. The liver is made up of a vast number of minute lobules or acini, about the average size of a millet seed; each contains the elements of which the entire organ is composed, viz., a network of biliary ducts, connected with their main trunks, and a mass of biliary cells, each connected with the three bloodvessels of the organ, the hepatic artery, vena portæ, and hepatic vein.

56 to 57. Fœtal surface of *placenta*, injected; also a vertical section. From the *chorica*, one of the membranes of the embryo, vascular tufts are developed in one portion, which dip down into cavities formed by the enlarged veins or sinuses of the uterus; these tufts form the *fœtal portion* of the placenta, as this compound organ is called; the blood of the fœtus receives its nutritious properties, and is freed from its impurities, through these tufts, which are bathed in the maternal blood of the sinuses, just as the gills of aquatic animals are bathed in the water.

58, 59, 60. *Appendix cœci*, injected; it may also be examined as a transparent object. With a low power its structural resemblance to the stomach and intestines may be seen.

61. Upper portion of *duodenum*, injected; showing villi, &c.

62. *Ileum*, showing villi and Peyer's glands. The small intestine is divided into the duodenum, jejunum, and ileum; the large intestine into cœcum, colon, and rectum.

63, 64, 65. Different portions of the *stomach*, injected.

66, 67. Fœtal *cauda equina*, showing its nucleated cell-structure; this is the terminal portion of the *spinal marrow*.

68, 69. *Ligamenta subflava*, from the space between the arches of the vertebræ of an adult; showing the characters of the *yellow fibrous tissue*, which is remarkable for elasticity; it shows the characteristic curling of the ends of the fibers.

70. *Glans penis*, injected; transverse section.

71. *Spermatozoa*.

72, 73. Vessels connecting the *membrana decidua* of the uterus with the chorion; in a fœtus of six weeks, and in one of twenty days old.

74, 75. *Muscular fibers*, showing striæ and a plexus of nutrient capillaries, appearing to run parallel to the fibers, and to inosculate with each other at considerable distances.

76. *Muscular fibers of the heart*.

77, 78. *Hairs*, with their follicles and related sebaceous glands.

The *hair* is developed in the interior of a *follicle*, formed by a depression of the true skin; the cells of the epidermic lining are most developed at the bottom; the dense exterior is called the *bulb;* the soft interior is called the *pulp*. The sheath of the hair is the external layer of cells, flattened and hardened by exposure; the growth of the hair takes place by a successive formation of cells at the base; the color is owing to a deposit of pigment in the cells while they constitute the soft part of the bulb. Human hair is not tubular, the dark band in the interior is owing partly to the presence of pigmentary matter, and partly to the refraction of light by the cylindrical surface. The *sebaceous glands* are little sacs grouped together, and connected with a common duct, opening usually into a hair follicle just within its orifice, at others on the cuticle; they are most numerous on the scalp and face.

79. *Mucous membrane* and *follicles of intestine;* not injected.

80. *Blood corpuscles*, from a healthy child. The human blood corpuscles appear like piles of flattened discs, or pieces of honey, of an average size of $\frac{1}{3200}$th of an inch.

81 to 108. Preparations of the *eye;* some injected, others as transparent objects, commencing with the epithelium of the infant's *cornea*, and including its different tunics and appendages; the *Meibomian glands* (the sebaceous glands of the lids), nearly as they lie in their natural position, and imbedded in the tarsal cartilage; the gland of the *caruncula lachrymalis*, with a portion of its duct (seen best with a low power); the *iris* and *ciliary processes*, injected; the *choroid*, showing the *venæ vorticosæ*, injected, and also as transparent objects; the *tunica Ruyscliana*, injected; the *crystalline lens*, fœtal and adult, showing numerous series of arches, formed by the arrangement of its fibers; the *artery* of the *capsule* of the *lens*, mounted by itself; the *canal of Petit*, surrounding the lens; hexagonal *pigment-cells* of the *choroid-hyaloid membrane*, inclosing the *vitreous humor*, with the epithelium on the folds or processes of this membrane; the *membrana pupillaris*, at different periods of fœtal life; the *sclerotic*, or white fibrous coat, injected, showing its connection with the cornea, which fits into it like a watch-glass; *fibers* of the *capsule of the lens*, &c.

109. Tubes of the *Testis*.

110. *Thymus gland*, injected.

111. *Membrana tympani;* fibrous lamina: transparent object.

112. The same, injected; showing a non-vascular spot about the attachment of the handle of the *malleus:* very fine.

113. *Lung*, injected.

114, 115. *Nerve*, from incisor-tooth. Dentine pulp, perfectly developed, can be seen Taken from specimen No. 26.

116. *Tongue*, finely injected; showing *filiform papillæ*, and the vessels beneath. These are the smallest of the papillæ, and cover all the forepart and middle of the surface of the tongue.

117. One *muscular fiber* of the ox, showing striæ.

118. Fibers of *crystalline lens* of the haddock, showing the *serrations* on the edges of the fibers much more distinctly than in the Mammalia.

119. *Corpora cavernosa*, from adult; 30 to 40 diameters.

120. *Epithelium of ureter*, of adult; about 300 diameters.

121. *Sac of fœtal tooth;* fifth month; about 100 diameters.

122. *Sac of fœtal tooth;* seventh month; about 60 diameters.

123. *Dentine cells*, forming into tubes; at upper part of specimen.

124. *Dentine and cementum*; adult. (See No. 20.)

125, 126. Hexagonal *enamel cells* of man, and the mastodon.

127. Longitudinal section of *enamel*, showing its cross-lines.

128. Longitudinal section of *enamel*, of crown of tooth.

129. Individual *enamel rods*, from mastodon's tooth.

130. Transverse section of *crown of sheep's tooth*, showing on a small portion the *cementum* external to the *enamel*.

131. *Inferior maxillary bone*, of human embryo, fifteen weeks old; showing dental groove and the alveoli of the two front teeth—right half of the jaw—may be seen without a magnifier.

132. *Alveolar process* of fœtus of four months.

133. Transverse section of *femur*.

134. *Temporal bone* of fœtus of twelve weeks; requires 50 diameters.

135. *Laminæ of bone*.

136. Under surface of *cuticle* of skin of negro; *pigment cells*.

137. Epithelium of *glans penis* of negro, showing *pigment granules* in clusters; the nuclei and cell-wall are scarcely visible.

138. Shows the development of *muscle*.

139. Longitudinal section of *femur*.

140. *Articular cartilage* of fœtus of eight months.

141. *Ileum;* showing *villi, glands of Lieberkühn, elastic fibrous tissue*, &c.

142. *Epithelium of cornea*.

143. Vertical section of *cornea*.

144. *Crystalline lens*, showing tripartite division and series of arches.

145. *Venæ vorticosæ;* direct or transmitted light.

146. Shows junction of *cornea* and *sclerotica*, and *vessels* of the latter.

147. Inner circle of *iris, ciliary processes*, &c.; direct or transmitted light.

148. *Duodenum* of fœtus, near pyloric orifice of stomach.

149. *Pupillary membrane*.

150. *Artery of capsule* of crystalline lens; 100 diameters.

151. *Filiform papillæ of tongue;* direct or transmitted light.

152. *Papillæ* beneath the *thumb-nail*.

153, 154. *Placenta;* vertical section and fœtal surface.

155. *Appendix cœci*.

156. *Duodenum* of fœtus; about five months.

157, 158, 159. Surface of *liver*, showing the *portal circulation*.

160. *Stomach*, of fœtus of four or five months, near cardiac orifice, showing *ridges, areolæ*, but *no villi:* very fine.

161. *Fœtal kidney*, showing the veins that accompany the uriniferous tubes.

162. *Sympathetic nerve*.

163. *Cauda equina*, showing its nucleated cell-structure.

164. *Kidney. Malpighian bodies*.

165. *Skin* from *palm of hand*.

166. *Kidney;* showing *stellate arrangement of external veins*.

167. *Gall-bladder;* mucous follicles.

168. *Kidney; corpora Malpighiana*, with *afferent and efferent artery*.

169. *Cuticle* from *dorsal surface of forefinger*, showing inter-papillary perforations.

170. Transverse section of *thumb-nail* and subjacent integument.

The art of minute injection has not been practiced in this country with any success till within a few years, and only since the microscopic study of the tissues has become general. Teachers of anatomy and physiology have been forced to rely on foreign sources for the preparations necessary to illustrate microscopic science. The specimens prepared by Messrs. Hett and Topping, of England, and by Dr. John Neill, of Philadelphia, have been the best to be had; Dr. Durkee, in his preparations, has met with remarkable success, and many of them are unsurpassed, and some of them, in the opinion of the best microscopists, not equaled by the best of foreign manufacture. It is very gratifying to know that we can now do for ourselves what others have hitherto done for us, and that, too, in a way that comes very near perfection. Microscopic anatomy has now become a necessary branch of medical education, and yet there is no Institution provided with any thing like the proper means for its illustration; the collection of Dr. Durkee would make a College prominent among our Medical Institutions, by adding to its cabinet what this country has never before had the chance of procuring, or Europe the means of supplying. We trust that such will be its destination, and that this unique collection will, ere long, be available for public instruction, equally honorable to the Institution which possesses it and to the man who has had the disposition and ability to prepare it.]

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57. Warren, Ira, M. D., *Boston, Massachusetts.*—Inventor and Proprietor.

Syringes for the larynx, pharynx, and nose; tonsil instrument; powder inhaler. (Patented.)

[Since physicians and surgeons have become acquainted with the alterative and antiphlogistic properties of nitrate of silver, as well as of its escharotic qualities, a new era has dawned in the treatment of many diseases formerly little understood, and considered the opprobria of medicine. Among the diseases eminently benefited by the nitrate of silver, is the subacute and chronic inflammation of the mucous membrane lining the nasal passages, the fauces, larynx, and trachea, and of the air-passages generally. A very common affection is a chronic inflammation of the larynx, and of its follicles, the first being *Laryngitis*, and the latter *Follicular Laryngitis*, or *Folliculitis*, as it is sometimes called; the popular name of *Bronchitis* is erroneous, this term

implying an inflammation of the mucous membrane lining the air-tubes of the lungs, which may or may not be implicated in the disease; it is also popularly known as the "Clergyman's Sore-throat," this class of the community being peculiarly liable to it from their frequent public speaking.

The shower-syringes of Dr. I. Warren are intended to take the place of the probang and sponge in the application of nitrate of silver and other caustics to the laryngeal surfaces. The *laryngeal* shower-syringe has a long curved tube attached to the barrel, having a round globe at the end, pierced with very minute holes around the center.

The *pharyngeal* shower-syringe has a straight tube, with a minutely perforated ball, which showers the fauces and pharynx in any desired direction. The *nasal* syringe has a short curve, otherwise the same; this is introduced by the mouth, and is the only proper means of reaching the nasal passages. These instruments are generally made with glass barrels and silver or gold tubes; the barrels are also made of gold. Besides nitrate of silver, the acid nitrate of mercury, and other caustics, may thus be easily and thoroughly brought into contact with the inflamed mucous membrane of these parts.

The powder inhaler consists of a glass tube, inclosing a smaller one, perforated with holes, in which the powder is placed; it is a simple and efficacious method of inhaling nitrate of silver and other impalpable powders, for the relief of chronic inflammation of the bronchial mucous membrane.

The tonsillotome is a very efficient instrument, much more certain than Velpeau's or the guillotine instrument; it is so easy to manage that the most inexperienced hand cannot fail to remove the tonsil. The ring is passed over the gland, the crescentic blades being concealed under the guards; a tenaculum then seizes the gland, draws it through, and retains it by a spring in the circle; the blades being then closed like a pair of scissors, the gland is cut off clean and smooth.]

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58. Powell, James W., M. D., *New York.*—Inventor and Proprietor.

Self-acting eye and ear fountains, improved eye magnet, auriscope, otoscope (for the Eustachian tube), human artificial eyes, aural instruments, and ear-trumpets.

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59. Pooley, Samuel J., *Warren, New Jersey.*—Maker.

A variety of surgical instruments.

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60. Matson, Morris, *Boston, Massachusetts.*—Manufacturer.

Improved syringe; a very convenient and excellent instrument, made of metal, and inclosed in a portable case.

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61. Hughes, William, *Brooklyn, New York.*—Manufacturer.

Catheters, probes, porte-caustique, syringes, and other surgical instruments, in silver.

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62. Ball, J., & Co., *New York.*—Inventors and Manufacturers.

Patent eye-cups, of vulcanized rubber, for attempts at restoring sight which has failed from age.

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63. Gray, James, *New York.*—Manufacturer.

Human artificial eyes.

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64. Bartlett, Joel, *New York.*—Agent.

American mechanical leech, and a variety of surgical instruments—cups, breast-pump, cervix uteri, eye and ear-glasses, dental leech.

[The principle of the mechanical leech is the same as the ordinary cupping-apparatus; its three lancet-points make a wound like that of the leech-bite instantaneously; the blood is drawn either by a pump, or by a simple India-rubber tube, or cup.]

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65. Bryan, James, M. D., *Philadelphia, Pennsylvania.*—Proprietor.

Case of trepanning instruments.

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66. Kellogg, George, *Birmingham, Connecticut.*—Manufacturer.

Surgical adjuster, for reducing fractures and dislocations; instrument for the examination of narrow passages in the human system; improved obstetrical forceps, with adjustable blades; Signiorini's tourniquet.

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67. Welch, Benjamin, *Lakeville, Connecticut.*—Maker.

Surgeons' splints, of wood and gutta-percha, and improved extension-apparatus for reducing fractures. The splints are composed of alternate layers of wood and gutta-percha; they are light, thin, but firm, elastic, and durable. By immersing them in hot water they become flexible, and may be moulded to the limb; on cooling they become firm.

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68. Selpho, William, *New York.*—Manufacturer.

Artificial limbs. The famous Anglesea-leg, so called from the Marquis of Anglesea, who lost a limb at the battle of Waterloo, and who wore one of these legs. It was invented by Mr. Potts, of whom Mr. Selpho was a pupil. The muscles and tendons are imitated by elastic bands.

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69. Palmer, B. Frank., *Philadelphia, Pennsylvania.*—Patentee and Manufacturer.

Patent artificial legs.

[The peculiarities consist in, 1st. An arrangement of cords and springs in the inside of the limb, by which, in an erect position, the leg is extended and the foot flexed: 2d. By a similar arrangement, the foot and toes are easily and gradually extended when the heel comes to the ground; thus avoiding the limping gait and unpleasant click made by the sudden stroke of the ball of the foot on the ground, which is so obvious in the ordinary leg: 3d. By a peculiar arrangement, the knee-joint is rendered little liable to wear, and all lateral rotary motion is prevented. The pressure of the artificial limb is made uniformly on the sides, and not on the end of the stump, thus avoiding the danger of ulceration of the flaps covering the end of the bone. A full-length limb for a medium-sized adult may be made to weigh less than 3½ pounds, and one below the knee less than two pounds.

The limb is supplied with tendons and springs which imitate nature, giving firmness to the joints, elasticity to the step, and freedom from all shocks and jarring sounds. The exterior is polished with a new preparation, impervious to water, and giving an enameled surface.]

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70. Drake, John S., & Co., *New York.*—Manufacturers.

Artificial self-acting leg.

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71. Noath, John, *Middleboro, Connecticut.*—Inventor and Manufacturer.

Improved trusses for rupture, with papier-maché and wooden pads, and new method of adjustment.

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72. Glover, Ralph, *New York.*—Manufacturer.

Trusses for inguinal and umbilical hernia, laced stockings for varicose veins, knee-caps, abdominal supporters, spinal elevators for curvature, extension-apparatus for elbow-joint, clubfoot-apparatus.

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73. Butler, Frederick M., *New York.*—Patentee and Manufacturer.

Trusses, spinal instruments, supporters, braces, and all the surgical appliances recently patented and entered by the exhibitor.

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74. Baigos, H. F., *New York.*—Inventor and Manufacturer.

Suspender for males, and skirt-supporter for females, combining a spinal and shoulder-brace; improved waist, for ladies' wear; abdominal supporter.

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75. Wilson, Norman, *Boston, Massachusetts.*—Manufacturer.

Supporters and braces.

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76. Phelps, J. W., M. D., *Boston, Massachusetts.*—Inventor and Manufacturer.

A fine and extensive collection of trusses, spinal braces, supporters, artificial limbs, and hands.

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77. Fitch, S. S., & Co., *New York.*—Manufacturers.

Shoulder-braces, abdominal supporters, and trusses.

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78. Banning, E. P., M. D., *New York.*—Inventor and Proprietor.

Body-braces, supporters and girdles, spring shoulder-braces, attachment-braces.

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79. Potter, John Hamilton, M. D., *New York.*—Manufacturer.

Abdominal supporter, suspender shoulder-brace, and shoulder-strap brace. Hood & Sanderson's patent abdominal supporter and truss.

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80. Marsh & Co., *New York.*—Manufacturers.

Trusses, abdominal supporters, shoulder-braces, spinal elevators, and various instruments for treatment of physical deformities.

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81. Vallaise, Charles, *New York.*—Manufacturer.

Surgical elastic apparatus, for varicose veins and swelling of the knee-joint.

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82. Davidson, J. M., *New York.*—Manufacturer.

Adhesive plaster, of great smoothness and evenness, and resisting well changes of temperature.

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83. Shivers, Charles, *Philadelphia, Pennsylvania.*—Manufacturer.

Adhesive plaster, for surgeons' use, spread by machinery, of a whitish color, and very smooth and even; necessary to keep it in tin canisters in hot climates.

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84. Woodward, Edward T., *Middletown, Connecticut.*—Exhibitor.

Judd's medicated liquid cuticle, to supply the place of the skin in burns, scalds, &c.

[The principle of healing wounds by strict exclusion from the air, has given rise to many preparations of collodia, and articles of similar properties, which are of constant and successful application in surgery.]

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85. Allen, Dr. J., *Cincinnati, Ohio.*—Inventor.

Specimen of new method of setting teeth.

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86. Ballard & Kingsley, *New York.*—Manufacturers.

Specimens of operations on natural teeth; varieties of artificial teeth, and operations therewith; jaw, with cavities of various sizes filled with gold.

[The following proportions are recommended (in the Repertory of Patent Inventions, 1845) as alloys for dentists' use:

	1st.	2d.	3d.	4th.	5th.
Gold,	1	1	1	—	6
Silver,	—	1	1	1	—
Platinum,	2	4	2	2	10
Palladium,	—	—	—	—	8

The gold and silver are first fused, and the platinum and palladium then added; they are fused in small crucibles, and require a blast. The solder for these alloys is either pure gold, or an alloy of gold and silver.

Pettenkofer (Ann. der Chem. and Pharm., 1849) describes an amalgam used by dentists. It is very hard, adhesive, and of a grayish color; and, owing to the very slight difference of density in the hard and soft state, it occupies the same space when cool as when soft. The mass becomes soft by heating the amalgam to nearly the boiling point of mercury, and then triturating it in a mortar. After cooling, it is soft, and easily worked with the fingers or by tools; in a few hours, it becomes intensely hard. To prepare it, weigh out a quantity of pure mercury, and dissolve it in hot sulphuric acid; triturate the resulting paste of sulphate with pure, finely divided copper, diffused in water at 140° to 158°. There must be copper enough to form a composition of 70 parts of mercury and 30 parts of copper, or enough to reduce all the mercury salt employed, and to alloy the mercury eliminated. After rubbing for some time, the amalgam is to be well washed, pressed in a leather bag, and formed into small cakes for use.]

87. Brown, Solyman, M. D., *New York.*—Manufacturer.
Dental instruments and materials of all kinds, dentifrices, and teeth.

88. Porter, Robert A., *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of dental operations.

89. Reynolds, R. T., M. D., *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of artificial teeth, set and unset.

90. Rowell, Warren, *New York.*—Manufacturer.
Gold artificial palate, with teeth.

91. Jones, White & McCurdy, *Philadelphia, Pennsylvania.*—Manufacturers.
Porcelain teeth, gold foil, corundum-wheels, files, and slabs, for dentists; moulds and casts.

92. Palmer, Drs. Thomas, & Brown, J. D., *Fitchburg, Massachusetts.*—Manufacturers.
Specimens of mechanical dentistry; newly improved artificial teeth, in blocks and on plates; specimens of the minerals (feldspar and quartz) from which the teeth are made, found in Fitchburg; dentifrices.

93. Ambler & Avery, *New York.*—Manufacturers.
Specimens of mechanical dentistry, machine for making gold plates for artificial teeth.

94. Mermier, Charles F., *Brooklyn, New York.*—Manufacturer.
Specimens of mechanical dentistry and dentists' materials.

95. Chapman, Drs. W. Z. W., & John W., *New York.*—Manufacturers.
Artificial teeth, single and in blocks; sets of teeth on gold plates; various mechanical devices pertaining to dentistry.

96. Hall, H. B., *Malden, Massachusetts.*—Manufacturer.
Specimens of gold-filling in teeth.

[Artificial teeth were for a long time made of the tusk of the hippopotamus, which nearly resembles the human tooth, and is susceptible of a high polish. They are now made of a kind of porcelain, of silex and feldspar, of such hardness as to resist a file; they are ground with corundum-wheels. Different makers use different proportions of these materials, giving a more or less natural appearance and color.

There is scarcely any art which has made greater progress within the last few years than the dental art, and none in which American skill and ingenuity stand more preëminent. This superiority is silently acknowledged by the well-known fact that the best dentists of the capitals of England and France are Americans; American dentists have operated on the mouths of half the crowned heads of Europe.

No art is more important, and none in more demand. Disease and loss of the teeth seems one of the consequences of the unnatural customs of civilization; savage races uniformly have sound teeth to remote age. As mastication of the food is half its digestion, it may readily be conceived that loss of the teeth, in addition to the consequent deformity, is a fruitful cause of dyspepsia and general derangement of the system.

Many decayed teeth are saved by a judicious and timely system of filling; gold leaf is usually employed for this purpose, and is the best, perhaps, though costly. Various other substances have been used, as tin-foil, various hardening pastes, wax, gutta-percha, vulcanized rubber, &c.; a good material, cheap, durable, and easy of introduction, is yet a desideratum in dental surgery.

But it is chiefly in the manufacture and adaptation of artificial teeth that American dentists have displayed their skill. The beautiful imitation of the teeth and gums, and the practical as well as ornamental purposes to which they are applied, is quite surprising. No loss of teeth, or absorption of socket and gum, or deficiency of palate even, seems too difficult to admit of remedy. The moulds and casts, from actual cases displayed, show that the art has reached a high degree of perfection among us. The teeth are attached in various ways, by pivot, by springs, and, in cases of blocks, by atmospheric pressure; the latter mode is of great advantage in cases where otherwise relief would be attended by a weight and arrangement of springs which would be extremely inconvenient; artificial palate and teeth, kept in place by atmospheric pressure, will sustain a weight of fifteen pounds suspended from them, which is very much more than they can ever be required to sustain naturally.

Even the specimens presented, good as they are, give but an imperfect idea of what the dental art has accomplished in this country; but, as far as they go, they abundantly prove that we have here all the materials, ingenuity and mechanical skill necessary for the complete prosecution of dental surgery.]

97. Stewart, Joseph, *New York.*—Proprietor.
Pulvermacher's patent hydro-electric voltaic chains and chain-batteries.

98. Smith, Samuel B., *New York.*—Inventor and Manufacturer.
Patent electro-magnetic machines, combining primary and secondary currents; electro-magnetic walking-cane; parlor, office, and pocket electro-magnetic machines, of primary currents.

99. Sandford, Charles, *New York.*—Manufacturer.
Magneto-electric machine, for medical purposes.

[The many points of resemblance, though far from identity, of the electric and magnetic currents to the impressions sent to and from the nervous centers in the human system, have for some years past led to the extensive employment of electricity and electro-magnetism in many chronic diseases, characterized by a diminution, increase, or irregular distribution of the nervous power. Numerous machines have been employed for this purpose, most of which have been of considerable advantage in the treatment of disease.

The first of the above instruments is an ingenious modification of the common voltaic pile, consisting of a chain composed of a series of zinc and copper wires, arranged on pieces of porous wood; by immersing this chain in vinegar for a short time, the porous material absorbs sufficient fluid to keep it in action a half an hour. A chain consists of sixty metallic elements, any number of which, to meet cases, may be joined together. The instrument develops a primary galvanic current, by many considered as less perturbating than the secondary electro-magnetic and magneto-electric currents. The chain is perfectly flexible, and is intended, if desirable, to be worn for a long time under the garments; its mild, but long continued influence, is sufficient to obtain many of the results expected from this agent. They give a continuous or interrupted current, accompanied by shocks, by a very simple mechanical contrivance; it may be used for galvano-puncture; it is sufficiently powerful for the decomposition of water and metallic salts in solution, and for galvano-plastic and galvanotyping operations.

The testimony of the most eminent surgeons, in this country and in Europe, goes to prove that it is an efficacious, portable, always available, and economical instrument for medical purposes.

The second instrument is of a somewhat different construction, as its name imports, depending for its efficacy on a magnetic force, developed by the passage of the galvanic current through the coils of wire around the magnet. Its efficacy as a remedial agent has been thoroughly tested; and such instruments are universally acknowledged to be valuable auxiliaries in the treatment of diseases of the nervous system. From their very power, they are liable to abuse in the hands of persons unacquainted with the physiology of the nervous system, and the nature and laws of electricity.

The last-named machine differs from the second, in that the electro-magnet is formed by a current of electricity from magnetic induction, instead of that generated in a galvanic battery. An armature of soft iron, surrounded by a coil of wire, is made to revolve rapidly before the poles of a horse-shoe magnet; at each revolution the polarity is changed, and currents which may be considered continuous, of great intensity, are produced. The advantage of such instruments is, that they are self-operating, without the agency of acids or liquids of any kind. From them may be obtained all the power necessary for the successful application of electricity in disease.

All of the above instruments will be found of advantage, according to the nature of the disease and the purpose of the surgeon.]

100. Fisher, Thomas, *Philadelphia, Pennsylvania.*—Designer and Manufacturer.
Mathematics simplified; a collection of diagrams to facilitate and insure the acquisition of mathematical knowledge. Dial of the seasons; a chart to illustrate the sun's declensions at all seasons, with the coincident effects of light and heat upon animal and vegetable life in all climates.

101. Chapman, James, *Brooklyn, New York.*—Author.
An improved historical, chronological, and analytical chart, in colors, of the principal nations of Europe and Asia, from the foundation of the City of Rome to the present time, embracing a period of 2,500 years.

102. Thayer, Bridgeman & Fannin, *New York.*—Manufacturers.
Maps of the World, United States, and North America (with the lines of communication between the New and Old World across the North Atlantic Ocean), Europe, and the State of New York.

103. Dripps, Matthew, *New York.*—Proprietor.
Map of the City of New York.

104. Colton, Joseph H., *New York.*—Publisher.
Maps of the World, United States, and Mexico.

[All general maps of the United States are of necessity chiefly compilations from imperfect materials. The portion of this country which has been systematically and correctly surveyed, so as to furnish the elements necessary for a good map, is very small in comparison with the remainder. The Coast Survey, the Topographical Bureau Lake, and other surveys, the State Survey of Massachusetts, and sundry local

surveys of limited extent, are the chief accurate materials for the construction of maps, either of the States individually, or of the collective United States. The United States Land Surveys afford much valuable matter for compilation, but these, being made only for a special purpose, are quite insufficient for the preparation of complete maps. All the remaining materials the compiler must derive from boundary laws and written descriptions, or from maps constructed to a great extent conjecturally, and with no basis of actual survey or measurement except such as the land-boundary surveys may chance to afford. Thus the compiler of State and general maps is constrained to use much very imperfect material, and to reconcile discrepancies as he can. Even the most conscientious geographer could not, from existing sources, make up a reliable map of the country, in all its civil divisions, boundaries, rivers, roads, railroads, canals, villages, and topography generally. A reckless compiler, with low ideas of accuracy and responsibility, must commit exceedingly gross errors, and errors, too, very difficult of detection, which could not be the case were there good maps with which to make comparisons.

Even in the older States, there is a conspicuous and almost uniform lack of well-determined interior points, and of those details of surface which county and town maps should exhibit. Such States as New York and Virginia are deficient in state and county maps on which confident reliance can be placed. In the western portion of our national domain, the amount of information is still restricted to the sketches of a few routes over which Government exploring parties have passed. California, Oregon, and Washington Territories, have been explored with unparalleled rapidity, and the materials for a general map, of moderate accuracy and abundance of detail, are rapidly accumulating. The great hiatus of information between the Mississippi valley and the Pacific border is rapidly being invaded by population, and it will not probably be many years, now, before a tolerable knowledge of the prominent geographical features, and of their positions, will be attained over the entire area of the United States. Meantime, it only remains to foster the best and most conscientious compilation of available materials, and by all means to increase their stock, not resting content till the entire United States, and each of the component States, shall have trustworthy surveys and maps, adequate for the daily and extraordinary wants of commerce, of common life, of legislation, and of science.]

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105. Cowperthwaite, Thomas & Co., *Philadelphia, Pennsylvania.*—Publishers.
Maps of the World and of the United States; Mitchell's Universal Atlas.

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106. Cooke, William D., *Raleigh, North Carolina.*—Designer and Maker.
Terrestrial globe, with elevations of surface to mark the mountains, and depressions of surface to mark seas, lakes, &c., for the use of the blind.

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107. Mason, J., *Brooklyn, New York.*—Inventor and Manufacturer.
Mammoth cosmoramic and astronomical globe for colleges and schools, with the continents in relief. It also represents the relations of the sun and moon to the earth, and to each other.

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108. Root, Samuel, *New York.*—Artist.
Collection of large crayon daguerreotypes, and daguerreotypes by the ordinary process; showing remarkable effects of light and shade, and a most life-like expression of the eyes.

[The process of taking crayon daguerreotypes is understood to be a French invention; the following is Mr. Mayall's process, from the London Athenæum, No. 1197:—

"First, take a daguerreotype image on a prepared plate as usual, taking care to mark the end of the plate on which the head is produced. When taken, and before mercurializing, remove the plate and place on it a plate of glass, prepared as follows: Second, cut a piece of thin plate-glass, of the same size as the daguerreotype plate; gum upon one side of it a thin oval piece of blackened zinc, the center of the oval to coincide with the center of the image upon the plate. Having carefully placed the glass thus prepared, with the center of the zinc disc upon the center of the image, expose the whole to daylight for twenty seconds. The action of the light will obliterate every trace of the image, from every part of the plate, except that which is covered with the blackened zinc; and also, from the thickness of the glass, the action will be refracted under the edges of the zinc disc, and will soften into the dark parts. Third, mercurialize the plate as usual; the image will be found with a halo of light around it, gradually softening into the background. By grinding the glass on which the disc is fixed, and by altering the size and shape of the disc, a variety of effects may be produced.]

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109. Root, M. A., *Philadelphia, Pennsylvania.*—Artist.
Collection of specimens of the arts of daguerreotyping, talbotyping, and crystalotyping.

[The daguerreotype is taken on a silvered metallic surface; the talbotype, or calotype, is taken on iodized paper. A crystallotype is a daguerreotype taken by means of glass on prepared paper.]

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110. Gurney, Jeremiah, *New York.*—Artist.
Collection of fine daguerreotype portraits.

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111. Haas, Phillip, *New York.*—Artist.
Daguerreotype pictures and frames; plain and colored.

[The daguerreotype process has called into existence many arts which yield support to thousands. Among these may be mentioned the makers of frames and cases; the preparers of the refined chemicals, as bromine, iodine, the salts of gold, and the hyposulphite of soda; the preparers of silver plates, and the makers of cameras and lenses; gilders, glass-cutters, &c.]

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112. Hawkins, E. C., *Cincinnati, Ohio.*—Daguerreotype Artist.
Plain and colored solographs; nebular daguerreotypes.

[A solograph is only another name for talbotype or calotype, or sun-pictures on paper.]

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113. Bisbee, A., *Dayton, Ohio.*—Daguerreotype Artist.
Specimens of the daguerreotype art on extra large plates; a picture taken on the Ohio river, in which the reflections of the steamboats in the water is very fine.

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114. North, William C., *Cleveland, Ohio.*—Daguerreotype Artist.
Fine specimens of daguerreotyping, in which the effect is much increased by the thick convex glass covers.

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115. Webster, E. L., & Brothers, *Louisville, Kentucky.*—Daguerreotype Artists.
Fine specimens of the daguerreotype art.

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116. Van Schneidan, P., *Chicago, Illinois.*—Daguerreotype Artist.
Daguerreotype pictures.

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117. Long, Edward, *St. Louis, Missouri.*—Daguerreotype Artist.
Daguerreotype portraits of members of the English and Classical High School, St. Louis, in inlaid frames; representations, very fine, of birds and insects.

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118. Kelsy, C. C., *Chicago, Illinois.*—Daguerreotype Artist.
Various specimens of daguerreotypes.

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119. Fitzgibbon, T. H., *St. Louis, Missouri.*—Daguerreotype Artist.
Tableau of elegantly mounted daguerreotypes.

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120. Hesler, Alexander, *Galena, Illinois.*—Daguerreotype Artist.
Daguerreotype pictures, embracing panoramic views of Galena City, Falls of St. Anthony, Min-ne-ha-ha Falls, and a fine collection of portraits.

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121. Whitney, T. F., *St. Paul's, Minnesota.*—Daguerreotype Artist.
Views of the Falls of St. Anthony, and a collection of portraits.

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122. Whitehurst, T. H., *Baltimore, Maryland.*—Daguerreotype Artist.
Very fine views of Niagara Falls, a collection of portraits, stereoscopes.

[The representation of falling water is perfect, as also is the spray from the cataract and the sheets of foam on the surface; these form a beautiful contrast with the shores and the trees, and give a singular beauty to the pictures of the Falls of St. Anthony and Niagara.]

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123. Nichols, Sheldon K., *Hartford, Connecticut.*—Daguerreotype Artist.
Specimen of daguerreotyping.

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124. Zuky, Antony C., *New York.*—Daguerreotype Artist.
A variety of daguerreotype pictures.

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125. Vannerson, J., *Pennsylvania Avenue, Washington, District of Columbia.*—Daguerreotype Artist.
A collection of daguerreotypes and compound cameras.

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126. Clark, David, *New Brunswick, New Jersey.*—Daguerreotype Artist.
Daguerreotype portraits.

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127. Lawrence, Martin M., *New York.*—Daguerreotype Artist.
A collection of daguerreotypes, very fine heads and figures, remarkable for their clearness of definition.

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128. Moissinet, Dobyns, Richardson & Co., *New Orleans, Louisiana.*—Daguerrean Artists.
Specimens of daguerreotypes, plain and colored.

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129. McDonnell, Donald & Co., *Buffalo, New York.*—Daguerreotype Artists.
Collection of daguerreotype pictures.

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130. Beals, A. T., *New York.*—Producer.
Collection of daguerreotypes in frames.

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131. Haraison & Hills, *Brooklyn, New York.*—Producers.
Descriptive daguerreotypes.

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132. Meade, Baothers, *New York.*—Produeers.
Fine daguerreotypes, representing Shakspeare's "Seven Ages of Man," taken from life subjects. Portrait of Daguerre, from life. Groups of portraits, plain and colored, of full length and half sizes. Pictures of Broadway and its numerous objects, taken instantaneously.

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133. Brady, Matthew B., *New York.*—Producer.
A collection of daguerreotypes, remarkable for beauty of execution and bold relief.

134. Brown, James, *New York.*—Producer.

A collection of daguerreotype portraits of Commodore Perry and officers of the United States Expedition to Japan.

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135. Howe, George M., *Portland, Maine.*—Producer.

Specimens of daguerreotypes, among which are some fine heads.

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136. Williamson, Charles H., *Brooklyn, New York.*—Producer.

Framed tableau of fine daguerreotypes.

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137. Kimball, J. A., *Louisville, Kentucky.*—Producer.

Portraits of the "Kentucky Brothers" in daguerreotype.

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138. Masury & Silsbee, *Boston, Massachusetts.*—Producers.

Fine collection of daguerreotype miniatures, plain and colored.

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139. Whipple, John A., *Boston, Massachusetts.*—Patentee and Producer.

Fine daguerreotypes by the common method. Specimens of crystallotypes, or daguerreotypes taken by means of glass upon prepared paper. Daguerreotype of the surface of the moon.

[Mr. Whipple's daguerreotypes of the moon's surface, taken by means of the large twenty-three feet equatorial of the Cambridge Observatory, show satisfactorily that much may be expected from photography in the delineation of the surface of our satellite. The pictures admit of being considerably magnified. Supposing pictures should be made sufficiently perfect to bear high magnifying powers; for instance, a first image of twelve inches in diameter (Mr. Whipple's being about two) and magnified eight times. In the words of Professor Phillips, before the British Association, "this diameter of ninety-six inches is about $\frac{1}{2\frac{1}{2}}$ of an inch for a mile." . . . "By such means we may have a record of the moon's physical aspect under every phase of illumination, under every condition of libration, nearly as we should see her at a distance of twenty-four miles through the earth's atmosphere. We should see and measure on the glass or the metal her mountains and valleys; her coasts and cliffs; her glens and precipices; her glacial moraines, eschars, and sand-banks; her craters of eruption, of upheaval, or explosion; her lava streams, or the scattered heaps projected from the interior. We should spy out the various actinic powers of the different parts of the surface, compare these with their obvious reflective powers, and thus come to some reasonable conjectures on the mysterious light-streaks which radiate from some of her mountains."

The surfaces for taking these pictures must be very sensitive, generally of highly sensitive collodion. It must be remembered, that moonlight is 100,000 times weaker than sunlight, and would not appear bright were it not for the surrounding darkness. The moon's image in the telescope has not more actinic (chemical) effect on the sensitive surface than some of the dull terrestrial objects which are slowly depicted in the camera. In the telescope used by Professor Phillips, with a sidereal focus of eleven feet, the moon's surface a little exceeds one and a quarter inches in dinameter; the time required for the firm impression of this image does not exceed five minutes, when the moon has a maximum south declination. In the great mirror of Lord Rosse, with a sidereal focus of fifty-two feet, a picture of the above size might be impressed in one-fourth of the time, or in the same time would give a picture twelve inches in diameter.

The telescope is made to follow the movements of the moon by an ingenious system of clock-work.

The structural peculiarities of the moon's surface, according to the latest researches of Mr. T. Nasmyth, are:

1st. A vast number of annular mountains, thrown up around valleys and plains, of a rugged character, with frequently a central conical hill. Sir John Herschel, who places the height of the highest of these mountains at one and three quarter miles (though others have estimated them at five miles), states that they offer the true volcanic characters, and says, from his own observation, that "in some of the principal ones, decisive marks of volcanic stratification, arising from successive deposits of ejected matter, may be clearly traced with powerful teleseopes."

The number and size of these crater-formed mountains, and the frequent occurrence of the central cone, leads to the conclusion, that they are the result of the same kind of action as has produced volcanoes on the earth; that they are, in fact, the craters of extinct volcanoes.

The cause of their vast numbers has been assigned by some to the rapid consolidation and contraction of the crust. From the proportions of the mass and surface of the moon, compared with the earth, the former has a heat-dispensing surface four times greater than that of the latter, in relation to its bulk. Mr. Nasmyth therefore suggests, that by the rapid cooling and contraction of the crust on the molten interior, the fluid matter has been forced out in those volcanic actions which formerly covered the surface of the moon with the vast numbers of immense craters and volcanic features which now give it its characteristic appearance. He conceives the moon's surface at present to indicate perfect repose, no change, in all probability, having taken place for ages.

The vast ranges of mountains are believed to have been caused by the continued progress of the collapse action, by the crushing down and wrinkling of the surface of the crust, no longer in contact with the molten interior, and its consequent arrangement in the form of mountain ranges.

The bright lines, radiating from some of the volcanic centers, are supposed to have been caused by the pressure of the molten material from underneath, causing cracks in the surface radiating from the point where the chief discharge was to take place, as occurs on the surface of a frozen pond, the molten material issuing at the same time through all the cracks, and appearing on the surface as a basaltic or igneous overflow, irrespective of irregularities of the surface. These are seen especially diverging from the volcanic center called Tycho.

2d. Slightly undulating plains of vast extent, relieved by a few crater-formed mountains (Copernicus, Kepler, Aristarchus, &c.), small rocky eminences, and circular depressions of various sizes. These "large regions," as Herschel calls them, are scattered over with fragments of rock, ashes, &c.

3d. Many cup-shaped valleys and cavities, in all parts, supposed by Mr. Nasmyth to have been the result of the crust settling down on the receding molten interior.]

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140. Harrison, C. C., *New York.*—Manufacturer.

Daguerreotype instruments and cameras, of various sizes.

[The camera, the principal instrument of the photographist, by which light becomes a chemical agent, is the invention of Baptista Porta, towards the end of the sixteenth century. In its simplest form, it was merely a dark chamber, furnished with a single double-convex lens, which gave an inverted image; this last inconvenience was afterwards removed by the use of a mirror. A lens, concave toward the object, and convex toward the image, made the picture clearer, without correcting the colors of the spectrum; an achromatic lens, the flint of glass toward the object, corrected this; and finally, M. Daguerre determined the relative proportions of the camera, which are still, for the most part, adopted. An achromatic lens is made double, one portion being made of flint-glass, the other of crown-glass, of different refractive powers; these correct each other, and give a perfect and colorless image.

The daguerreotype art, in America, has arrived at great perfection, which is in a great measure due to the extreme clearness of the atmosphere; aided, however, by skillful manipulation. The pictures exhibited are remarkable for a brightness and distinctness observable in no other country.

The two principal divisions of photography, or light-drawing, are the daguerreotype and the talbotype; both of these are *sun-pictures*, the former on plates of silvered copper, the latter on paper. They are the results of researches carried on at the same time, though without any knowledge of each other's investigations, by M. Daguerre in France, and by Mr. Fox Talbot in England. There has been considerable dispute as to whether the first step in photography was taken in France or in England; it seems, however, clear that Mr. Talbot's process was known to the public six months before the process of M. Daguerre was published. The daguerreotype process had its origin in France, was improved in England, and perfected in America; the talbotype process is due to England.

Daguerreotypes.—Daguerre's discovery of the sensitiveness of iodized silver plates to light, and the development of pictures made thereon by the action of mercurial vapor, was first made known to the French Academy of Sciences, Paris, in January, 1839.

Daguerreotype plates are of copper, plated with silver, and highly polished. The agent employed to act chemically on the plate, must be in such a condition that the affinity may be easily destroyed by the agency of sunlight; the compounds of bromine and iodine produce the greatest degree of sensibility. The polished plate is accordingly exposed to the mixed vapors of iodine and bromine; this colors the silver with a very delicate coating of bromo-iodide of silver. The plate is then placed in the camera-obscura, properly adjusted, when the image which falls on the prepared plate effects a chemical change, in exact proportion to the intensity of the radiations from the object to be taken. The image is not yet visible; to develop it, the plate is exposed to mercurial vapor, which is condensed on the surface in exact relation to the amount of chemical change; the picture, in all its details, results therefore from the contrast between the pulverulent deposit of mercury and the polished silver plate. The picture is rendered permanent against the further action of the sun's rays by washing with the hydrosulphite of soda; it is rendered proof against the operation of time by subsequent washing with a solution of the double hyposulphite of soda and gold, and heating with a strong spirit-lamp, which brings out the picture in all its brightness; after this the plate is washed and dried.

The colored daguerreotypes are the result of subsequent painting by hand; these are generally more sought after than the plain, though the beauty and delicacy of the picture is in a great measure destroyed by this process.

The enameled daguerreotypes have merely an addition of some preparation resembling a varnish, floated over the plate by the agency of heat; this transparent covering removes the glare of the polished plate.

An engraved border is sometimes produced by means of a perforated plate of metal, placed over the picture, and momentarily exposed to the light; on exposure to the mercury the engraved appearance is produced.

Talbotypes.—This name was given, by Sir David Brewster, to the process discovered by Mr. Fox Talbot; *calotype* and "sun-picture" are synonymous words. In this process, paper is used instead of a silvered copper plate. Mr Talbot's process, as described in the specification of his patent, is as follows: 100 grains of crystallized nitrate of silver are dissolved in six ounces of distilled water; the best writing-paper is washed with a soft brush, on one side, with this solution; when nearly dry (which should be done cautiously at a distance from the fire, or spontaneously in a dark room), it should be dipped in a solution of iodide of potassium, 500 grains to a pint of water, for two or three minutes; being then dipped in water, and lightly dried with blotting-paper, it should be thoroughly dried by the fire. This is called *iodized paper*, from its having a pale-yellow coating of iodide of silver; it is not very sensitive to light, and

may be kept for any length of time, without undergoing any change, if protected from the sunlight. When the paper is wanted for use, it is washed in a *gallo-nitrate of silver* solution, consisting of equal volumes of a saturated solution of crystallized gallic acid in cold water, and a solution of 50 grains of crystallized nitrate of silver in an ounce of distilled water, to which is added one-sixth of its volume of strong acetic acid. This being allowed to remain for about half a minute, the paper must be dipped in water, and lightly dried with blotting-paper; this operation requires the total exclusion of daylight. Such paper is exquisitely sensitive to light, less than a second of diffused daylight being sufficient to set up a change. The paper being placed in the camera, and the image of any object presented to it, should then be removed to an artificially and dimly lighted room, and washed with the solution of the gallo-nitrate of silver. When the picture is sufficiently intense, the paper is soaked in water, and afterwards in a solution of hyposulphite of soda, to remove the sensitive coating, and render it permanent.

The image thus obtained is a negative one, that is, the lights and shadows are the reverse of those of nature; to obtain a positive, or correct picture, a second copy must be taken from the original negative. Positives made on albumenized paper are better than those taken on ordinary paper.

The advantages of the talbotype are very great: First, the papers may be prepared at leisure, before they are wanted for use, and may be carried in a portfolio; second, from one good negative original, many positives may be taken (in a rainy day), and therefore very cheaply supplied; third, they may be obliterated, so as to reduce them to the condition of white paper, and yet be susceptible of revival at any instant, for an indefinite period of time.

Talbotype pictures may be produced also on silk and other fabrics; on porcelain, coated glass, stone, steel, wood, and iron. Treated with caustic potash and a lead salt, they present an agreeable tint, the tone of which is a fine sepia-brown.

The *cyanotype* process of Sir John Herschel consists in the change of persalt of iron into a protosalt, by the solar rays; the paper is then washed with a compound of cyanogen, and the picture is represented in Prussian blue.

The *chrysotype* process of Sir John Herschel is similar, only that a solution of gold is applied to the altered iron salt, and oxyd of gold is formed instead of Prussian blue.

The *chromatype* process of Mr. Robert Hunt is formed by washing paper with a mixture of the bichromate of potash and sulphate of copper; and after the picture has been faintly developed by the chemical principle of the solar light, it is washed with nitrate of silver, by which a *positive* picture, or one with correct light and shadows, is produced by one operation.

Hyalotypes, or photographic pictures on glass, are of more recent introduction, though the principles are the same as in the talbotype process. From the inequality of paper, pictures are very apt to have a confused, blurred, or woolly appearance, which is entirely obviated by taking the negative on glass or porcelain. Albumen, gelatine, serum, collodion, have been recommended for application on glass, but albumen has been found to answer best. To about five ounces of the albumen of fresh eggs are added 100 grains of iodide of potassium, 20 grains of the bromide, and 10 grains of common salt. This is used for the coating of the glass; ground glass is the best, on which the adherence is more perfect, the success of the proof depending principally on the evenness of the coat of albumen. When required for use, a solution of the nitrate of silver, with the addition of some gallic acid, is applied, and the picture is developed in the ordinary manner. The "prints" from these plates are of an exquisitely beautiful character.

Collodion, which is gun-cotton dissolved in ether, is applied in a similar manner, mixed with the iodide of silver; this is exceedingly sensitive, pictures being obtained in a few seconds. Instantaneous pictures have been made by the introduction of a new element, by Mr. Talbot, the illumination being for an instant only, by an electric spark.—*Condensed chiefly from Mr. Robert Hunt's Handbook to the Official Catalogues, London*, 1852.

The *crystalotype* of Mr. Whipple appears to be a positive picture, on paper, taken from a negative on glass.

Mr. R. Langton, of Manchester, England, has taken some very fine photographs on box-wood; such blocks are all ready for the engraver's burin. This must save great time and expense in wood-engraving, as all the preliminary labor of the draughtsman is dispensed with. It will be of great value in drawings of machinery in perspective, doing in a few seconds what an artist could not, so well, in many hours; it opens the way for a vast system of decoration on any prescribed wood, and at a very cheap rate: indeed, it is impossible to say where this process may not find a useful application.

The discoveries of Daguerre and Talbot are valuable, not only as specimens of art, but they are of vast importance for the extension of almost every branch of human knowledge. Natural objects, animate and inanimate, scenery, architectural ornaments, old inscriptions and manuscripts, magnified views of microscopic structure, and a thousand other representations of beautiful and important objects, may be multiplied with the utmost accuracy, at a trifling expense, and to any desired extent.

M. Plant is the author of a process of vitrification of photographic pictures. A photograph is first taken on albumenized glass, which is subjected to a strong heat, so as to redden the glass; the albumen is destroyed, and the photograph, if negative, becomes positive by reflection. The picture is made of pure silver, which adheres so strongly to the glass that it may be polished without alteration. On exposing this glass to the action of hydrofluoric acid, in vapor, an engraving of the design is obtained over parts not covered by the silver image; the image may be strengthened by a galvanic deposit, and makes a kind of plate from which engravings may be taken. If, instead of arresting the process at a red heat, it is continued till the glass enters into fusion, the image sinks into the interior of the glass, without being altered, and covers itself with a vitreous varnish. The design appears as if inclosed between two plates of glass; and, if positive proofs are employed, the method may be used for making pictured glass, which may doubtless be colored by the usual processes.

Mr. Wulff has succeeded in taking photographic portraits on linen cloth covered with collodion.—*From Silliman's Journal, January*, 1854.]

GREAT BRITAIN AND IRELAND.

141. Goddard, James T., *Whitton, near Isleworth, Middlesex, England.*—Manufacturer.
Achromatic 52-inch astronomical telescope.

142. Ackland, William, 93 *Hatton Garden, London.*—Inventor.
Hydrometers, alkalimeters, eudiometers, saccharometer, urinometer, thermometers, to illustrate the application of Ackland's dividing machine.

143. Davis, John, *Derby, England.*—Manufacturer.
New anatomical microscopes, anemometers (Biram's patent) for measuring the force and amount of the wind, letter balance.

144. Rowley, John, *Wolverhampton, England.*—Manufacturer.
Fine steel-bowed spectacles having the front framework made in one solid piece, one pair whose extreme weight is two pennyweights; spectacles adapted for both a long and a short distance; railroad spectacles; eye-glasses.

145. Langdon & Taberez, *Derby, England.*—Patentees and Manufacturers.
Patent self-adjusting and other surgical elastic stockings, abdominal supporters, knee-caps, &c.

146. Solomon, Joseph, *Red Lion Square, London.*—Manufacturer.
Stereoscopes, with improved meniscus lenses; telescopes; achromatic microscope; Dupuis's measurer; spectacles, common and railway; lenses; opera-glasses.

[The stereoscope is an exceedingly interesting instrument, recently invented, in its first form, by Mr. Wheatstone, and, in the form now chiefly used, by Sir David Brewster. It throws much light on the nature of vision and perspective, and has led to the investigation of numerous singular phenomena of sight. Its theory is simple, and its application gives results of peculiar beauty.

If two plane-pictures be made of any near object, as a statue for instance, one of which is drawn for each eye of a spectator, so that all the perspective or projecting rays shall converge, for one, to the right eye, and for the other to the left, these pictures will be very sensibly unlike each other. Indeed, each position of perspective view for a single eye gives a special relation of the perspective rays, and brings into view a field on the object slightly different from the field visible from any other point. The plane of representation cutting these rays must, therefore, give a special drawing for each position of the eye. If two perspectives of the same subject, taken, one from the right-eye point, and the other from the corresponding left-eye point, be so placed as to be at once viewed naturally, by their respective eyes, the resulting effect is marvelously life-like and solid. The apparent relief is, essentially, that given by both eyes looking naturally at the object itself.

Wheatstone's stereoscope consists of two plane-mirrors, meeting in a right angle, the pictures being placed respectively to the right and left, so that the right eye sees the right-eye picture in the right-hand mirror, and similarly for the left eye. A simple box-frame receives the whole. Brewster's binocular camera has an adjustable eye-glass for each eye, through which it looks directly at its appropriate picture, in the lower part of the case, the arrangement being made for distinct vision at the fixed distance of the pictures. Brewster and others have proposed various modifications and applications, the one of most general interest being that employed in daguerreotype cases, in which binocular daguerreotypes, taken in a special double camera, are so arranged that, on folding out a card containing two eye-lenses, stereoscopic vision is obtained, and the portrait assumes the relief of nature. As stereoscopic drawings require accurate mutual adaptation, to insure their harmonious blending in one clear pictorial perception, simultaneous daguerreotypes or photographs are far the best possible pictures for this purpose. Except in geometrical figures, binocular drawings are too difficult to construct for the experiment to succeed.

The stereoscope brings into full view the importance of the third dimension, in giving relief to our habitual eye-pictures of externals, and shows that the apparent flatness of plane-pictures is an incurable fault, incident to single delineations on a plane. The mental actions, whence our optical perceptions of external solidity and depth are derived, seem, in no small degree, based on the binocular character of our vision. The distance between the optical centers of our two eyes is the primary base-line of our visual triangulation, and to this, as an optical unit, experience teaches us unconsciously to refer external distances. For near objects, the two pictures are so dissimilar as to give great vividness to the perception of perspective depth, and the mind extends its triangulation, or mental location, from the near to the more remote, chiefly dwelling on the mutual relations of externals.]

147. Frodshaw, Charles, *Strand, London.*—Manufacturer.
Astronomical clocks, eight-day clocks, chronometer watches.

148. Cowderoy, Richard F., *New Road, London.*—Manufacturer.
Gold chronometers, duplex levers, &c.

149. Donegan, John, *Upper Ormond Quay, Dublin.*—Manufacturer.
Watches, of gold and silver, made in Dublin.

150. Johnson, E. D., *City Road, London.*—Manufacturer. William Baker, 45 *Ann Street.*—Agent
A fine display of chronometers and watches, in departments illustrating the movements, balances, works, dials, faces, and backs.

151. Glover, Thomas, *Clerkenwell, London.*—Patentee and Manufacturer.
Model of Croll's patent dry gas-meter. This meter, of 3,000 lights, measured all the gas consumed in the London Crystal Palace.

152. Collins, Henry George, *Paternoster Row, London.*—Proprietor.
Pair of globes, celestial and terrestrial, with the most modern discoveries; new atlas, maps, &c.

153. Gray & Keen, *Liverpool.*—Manufacturers.
Compasses.—Royal floating compass, with complete insulation, which has become necessary by the destruction of the centers of action, by the velocity with which iron vessels are driven through the water. No compass can indicate correctly, unless the centers of action are kept in perfect order; the destruction of these centers in the above-named vessels has been often accomplished in the short time of six hours. This arrangement provides against any direct communication from the machinery, blowing off the boilers, &c. It is used in nearly every steamer sailing from Liverpool.
Barometers, improved sympiesometer, and thermometers.

154. Elliott & Sons, 56 *Strand, London.*—Manufacturers.
Mathematical and drawing instruments and materials, telescopes, opera-glasses, spectacles, rules, surveyors' instruments.

155. Watson, Henry, *Newcastle-upon-Tyne, England.*—Manufacturer.
Three safety-lamps for coal-miners: the Davy Lamp, the Stephenson Lamp, and the Clanny Lamp.

[All these instruments depend for their protective powers on the principle discovered by Sir Humphrey Davy, that flame is so cooled by passing through wire-gauze, which is an excellent conductor and radiator of heat, that it will not inflame the explosive gases on the outside of the lamp. The inflammable gas of coal mines, or *fire-damp*, as it is called by the miners, is chiefly carburetted hydrogen; this, mixed with air, forms a highly explosive mixture, which has been the cause of fearful loss of life. The flame of the safety-lamp is surrounded by a cylindrical frame of fine wire-gauze; the gas burns on the inside, but does not communicate its flame to the outside. The patent lamps for burning "camphene" and other "burning fluids," depend for their safety on this principle; while the wire is intact, explosion is impossible. With all this provision for their safety, miners are often careless enough to open their lamps to light their pipes and for other reasons, and have thus caused many severe explosions.]

156. White, T., *Clerkenwell, London.*—Manufacturer.
Enameled watch faces.

157. Sturrock, Thomas, *Duke Street, Leith, Scotland.*—Inventor.
Model of a bed for invalids.

[This is a simple and useful arrangement, adapted to any ordinary bedstead, and must prove of great advantage to an invalid. It is convenient for change of posture, as the head may be raised, and the feet lowered, by simply turning two winches at the side, easily accessible to the invalid. A fold is attached to the footboard, which hinges over, and may be made either a writing-desk or a table; the footboard also may be removed for applying a bath.]

158. Watson, John, *Jersey, Great Britain.*—Inventor and Manufacturer.
Improved foot-warmer, consisting of a tin box, with covered depressions for both feet; it has two bottoms, between which water of the required temperature is poured.

159. Badcock, John, *Brighton, England.*—Producer.
Photographic specimens of vaccine, produced by inoculating the cow with small-pox, illustrating the progress of the vaccine vesicle in all its stages.

160. Peterman, Augustus, *Charing Cross, London.*—Exhibitor.
Maps, plans, and geographical illustrations; embracing geographical views of the Great Exhibition of 1851.

161. Wyld, James, *Leicester Square, London.*—Manufacturer.
A block-map of Sicily.

162. Holden, —, *Dublin.*—Proprietor.
Geological maps.

163. Powell, —, *Dublin.*—Proprietor.
Maps of Ireland.

BRITISH COLONIES—CANADA.

164. Kerr, Dr., *Galt, Canada West.*—Inventor.
A set of splints for fractures, made entirely of tinned iron.

[They are firm and inflexible; they are perforated every where by small holes, and large portions are taken out for the purpose of lightness, wherever it was compatible with strength. Surgeons would be of different opinions as to the propriety of using such splints on all occasions, but there is no question of their utility in many cases.]

165. Esinhart, John, *La Prairie, Canada East.*
A map of the United States, Mexico, and Guatimala, executed with a pen by a boy fourteen years of age, in 1850. A work requiring great patience, labor, and mechanical skill.

FRANCE.

167. Beranger & Co., *Lyons.*—Manufacturers.
Patent French balances.

168. Vedy, F., 52 *Rue de Bondy, Paris.*—Manufacturer.
A variety of astronomical instruments for the Navy. Varieties of sextants, highly finished.

169. Gavard, Adrien, 9 *Quai de l'Horloge, Paris.*—Manufacturer.
Improved pantagraph.

[The improvement consists principally in a better arrangement of the steadying weight of the pivot and the larger size of the wheels; this adds greatly to the smooth working of the instrument, so much so that even persons unaccustomed to its use may produce smooth and unbroken lines.

The pantagraph, when constructed in the best manner, affords a very good means of mechanically changing line-drawings from one scale to another, or of copying them. Its mathematical principle is contained in a word, being simply, *proportionality*. The tracing and pencil points are similarly carried on the same or similar jointed quadrilaterals, so as to describe by constraint exactly similar motions, while the tracer is guided over the lines to be copied. Various combinations have been tried, but all agree in principle. Any combination used should prevent the original and copy-sheets from interfering with each other, and it is peculiarly important that the frame should move freely before the hand, as a considerable resistance or weight of the moving parts makes the motion uneven and jumping. Nice workmanship is indispensable to accurate results, and unless this be to a good extent secured, the pantagraph should give place to the method of corresponding squares. One person manages the trace, and one regulates the pencil. In reducing or enlarging maps, including an extensive terrestrial area, the projections of the two sheets must be identical in character, or the pantagraph will not reduce correctly. The pantagraph, and also the camera lucida, are inferior to the method of squares, when the materials reduced, copied, or enlarged, are to be reviewed critically in the process.

The complicated and beautiful medal-ruling machine, sometimes called a pantagraph, and much used for copying coins, dies, and other low reliefs, to be etched and used in bank-note plates, is quite too intricate to permit a brief analysis.

The pantagraph was invented by the Jesuit, Christopher Scheiner, in 1603.]

170. Miraud, Sen'r, *Rue St. Jacques, Paris.*—Manufacturer.
Microscopes on the English plan, with six eye-glasses and micrometer, camera lucida and polarizing apparatus, prepared objects, and various microscopical appliances.

171. Nachet, 16 *Rue Serpente, Paris.*—Manufacturer.
Microscopes, of various descriptions, mounted for anatomical and general purposes.

172. Lebrew, Alexandre, *St. Pierre le Bitry, near Paris.*—Manufacturer.
Microscopes, simple and compound; telescopes, spy-glasses, loupes, lenses, opera-glasses.

173. Duboscq-Soleil, *Rue de l'Odéon, Paris.*—Manufacturer.
Large collection of philosophical apparatus. Cyanometer and polarimeter, of M. Arago, for measuring the intensity of the polarization, and of the blue color of the sky; heliostat, of Mr. Silbermann; Wheatstone's chromatic clock, improved, with a double-rotation plate; stereoscopes; apparatus for experiments with artificial light.

174. Boutems, *Paris.*—Manufacturer.
Mechanical birds, as ornaments to clocks. These imitate admirably the singing and motions of birds, which are perched in the branches of trees; at the root of one flows a crystal fountain in a moss-covered grotto.

175. Renoars, *Paris.*—Manufacturer.
Optical glasses.

176. Jacquemin & Brother, *Morez, Jura.*—Manufacturers.
Spectacles and dials.

177. Lemaire, *Paris.*—Manufacturer.
Optical glasses.

178. Goldbacher, M., *France, and Bowery, New York.*—Manufacturer.
Compound microscope, highly ornamented opera-glasses, spectacles, loupes, Lavater level, for ascertaining either the horizontal or vertical line, or the inclination of any oblique line.

179. Lereoux Bouilly de Vauvers, *Caucale, Ille and Vilaine.*—Manufacturer.
Clock, with a new system of striking mechanism.

180. Pierret, V. A., *Rue des Bons Enfans, Paris.*—Manufacturer.
Small skeleton-clocks and alarm-clocks, with glass cases.

181. Montandon, J. H., Jr., *Paris.*—Manufacturer.
Springs for clocks, watches, mechanical lamps, musical boxes, &c. The yearly manufacture is about 60,000 dozen watch-springs and 60,000 pairs of clock-springs. The establishment is on a large scale.

182. Minal, Alex., *Rue de l'Echéquier, Paris.*—Manufacturer.
Three musical clocks, ornamented with trees and flowers, among which are mechanical singing birds and butterflies in motion.

182a. Fouque, Sen., *Paris.*—Manufacturer.
A bronze-gilt clock, with astronomical appliances, supported on four Egyptian figures, in the form of a temple, on which is a planetarium, representing the relations of the sun and moon to the earth; a highly finished piece of mechanism.

183. Maes, J., *Cour des petites Ecuries, Paris.*—Manufacturer and Proprietor.
Objectives, for daguerreotype apparatus; discs, for the same apparatus; glasses for optical instruments, and prisms, of extraordinary clearness.

[The clearness of this glass is very remarkable; in its manufacture, sulphate of zinc is employed, instead of lead, as in the ordinary method. From their clearness, they have received the name of Crystals of Clichy; they are manufactured at Clichy, near Paris.]

184. Biondetti, Henri, *Rue Neuve Vivienne, Paris.*—Manufacturer.
Hernia trusses; apparatus for clubfoot; artificial foot and hand, in wood, with joints and springs to imitate the natural movements.

185. Varnout & Galante, *Place Dauphine, Paris.*—Manufacturers.
Surgical apparatus and appliances of vulcanized India-rubber.

[The advantages which vulcanized India-rubber, or caoutchouc, combined with sulphur, has over the ordinary rubber, are very great, and such as make the former admirably adapted for surgical apparatus; when stretched, it resumes exactly its first dimensions; it is much stronger, it is not softened by oils and fatty bodies, and is not affected by heat or cold; it is equally impermeable to moisture, and resists chemical agents as well as ordinary rubber, and has a more velvety and polished surface.]

186. Luer, Arnatus, *Place de l'Ecole de Medecine, Paris.*—Manufacturer.
A great variety of surgical instruments, of great ingenuity, and highly finished.

187. Charriere, Jr., *Rue de l'Ecole de Medecine, Paris.*—Manufacturer.
Surgical instruments in great variety, in a library-case.

[In the above collections are displayed the excellence and finish peculiar to French instruments of surgery. They contain all the principal instruments and appliances used in modern surgery, from the simplest to the most complicated.]

188. Cosquin, J., *Rue de Cherche Midi, Paris.*—Exhibitor.
Three frames containing topographical drawings.

189. Delsol, T. T., *Paris.*—Engraver.
Maps and plans of Switzerland and vicinity, and of Constantine, in Algeria.

190. Collin, C. E., *Quai Conti, Paris.*—Engraver.
Hydrographic engravings. Maps, plans, and charts, of the French coasts and other regions, forming a part of those published by the "Dépôt Général de la Marine de France."

191. Blanquart, Evrard, *Lille, du Nord.*—Inventor and Producer.
A frame containing photographic illustrations of various subjects.

[The science and the art of photography are still in a highly progressive state, nor can it be rationally doubted that many practical facilities and untried applications yet remain to be made. In 1839, Daguerre's discovery was first announced, and in the same year Mr. Fox Talbot published his mode of producing negative and positive pictures, as employed in photography, on paper. From these beginnings, photography has steadily and rapidly advanced, adding yearly to its resources, by new processes, new materials, improved manipulations, and also by the researches and reasonings of such men as Niepce, J. Herschel, Brewster, Robert Hunt, and Blanquart-Evrard. So extensive is the list of methods and materials used, of modifications and applications effected or proposed, that photographic journals are sustained, societies are formed, and treatises are written in furtherance of the new photographic profession, now numerous and rapidly increasing.

The name, Photography, literally includes all the arts for producing pictures by the chemical agency of light. In point of fact, light-rays are not the true graphic agents in photography; but invisible chemical, or actinic rays, are the chief, if not the only source of those subtile molecular movements, which serve to fix lights and shades on polished silver plates, on sensitive paper, on glass coated with albumen, with collodion, or combined collodion and gutta-percha, or on artificial ivory made sensitive. In photography on paper, glass, or ivory, a negative picture is first taken, giving the lights and shades reversed, and from this any number of positive pictures being taken, afford true and harmonious representations of landscapes, paintings, statues, human figures, or any other subjects. The great present desideratum, is, the permanent, correct fixation of natural colors; which, if superadded to light and shade, would realize the highest fidelity of delineation. Niepce's researches show a high probability of the ultimate realizing of this effect, for he has photographed with much fidelity the prismatic spectrum. The combination of the stereoscope with binocular daguerreotypes and photographs, already produces unequaled likenesses, though much, doubtless, remains to be done, for giving full perfection to this union.

The photographic pictures exhibited by Evrard Blanquart, on paper prepared by an excellent process of his discovering (An. de Chimie et de Phys. XX.), do real honor to this art. The reproductions of old pictures are, on the whole, highly successful. The French photographs of Egyptian and Nubian antiquities and scenery are among the most successful products of the art; and the Zoological Photography, published by Lemercier & Bisson, at nine francs for each *livraison* of six small folio sheets, each giving, in the greatest beauty of detail, several select subjects from the Paris Natural History Museum, seems to present a clear foreshadowing of the part this beautiful art may bear in future pictorial publications.]

192. Laass d'Aguen, Victor, *Boulevard des Invalides, Paris.*—Inventor.
Maps in relief, and system of writing for the blind, used in the Institution for the Young Blind at Paris, and by the institutions and blind of France. By this system, the blind are enabled to write with considerable rapidity, and to acquire a very complete knowledge of geography.

THE GERMAN STATES.

193. Ansfeld, Herman, *Gotha, Saxe-Gotha.*—Manufacturer.
Dr. Flaussen's Planimeter, for measuring the area of any surface, by determining how many squares, of certain measures of length, are contained in it. The measurements are given in English square lines.

194. Luhme, J. F., & Co., *Berlin, Prussia.*—Manufacturers.
Air-pump and accompanying apparatus; chemical balances and scales, and apparatus; chests of chemicals; polarizing apparatus for saccharine fluids; Kipp's Sulphuretted Hydrogen Apparatus; chemical lamps; mathematical instruments.

195. Schmidt, Julius H., *Halle-on-the-Saale, Prussia.*—Manufacturer.
Mathematical and chemical instruments, thermometers, microscopes, and optical instruments.

196. Rudell, Alwin, *Halle-on-the-Saale, Prussia.*—Manufacturer.
Chemical apparatus for analytical purposes; chemical reagents; areämeter; tests; chemical materials.

197. Busch, Emil, *Rathenow, Prussia.*—Manufacturer.
Optical and photographic apparatus; spectacles; eye-glasses; spy-glasses; opera-glasses: highly finished.

198. Schlosser, J., *Ratingen.*—Manufacturer.
Black-lead crucibles.

199. Riedel, —, *Nuremberg, Bavaria.*—Manufacturer.
Spectacles and eye-glasses.

200. Egberts, J. H., *Bremen.*—Manufacturer.
Air-gun.

[In these instruments, instead of the explosive force of gunpowder, the force of condensed and compressed air is employed. The air, condensed by a syringe in the stock, is allowed to escape, by means of a valve behind the ball, which it forces out with considerable power. These guns are generally so complicated, so liable to get out of order, and so expensive, that they are of little use except as scientific toys.]

201. Braun, —, *Nuremberg, Bavaria.*—Manufacturer.
Scales for apothecaries.

202. Sichler, G. H., *Nuremberg, Bavaria.*—Manufacturer.
Scales in pocket-cases.

203. Salziger, J. P., *Nuremberg, Bavaria.*—Exhibitor.
Terrestrial globes.

204. Korulein, W., *Nuremberg, Bavaria.*—Manufacturer.
Scales for apothecaries.

205. Landgraf, J. G., *Nuremberg, Bavaria.*—Manufacturer.
Eye-glasses.

206. Kapeller, L., & Son, *Hafuerzell, near Passau, Bavaria.*—Manufacturers.
Black-lead crucibles for melting gold, silver, steel, &c.; these will support the highest temperatures, and are very cheap.

207. Gundermann, S., *Nuremberg, Bavaria.*—Manufacturer.
Syringes of various descriptions.

208. Blumenthal, —, *Darmstadt, Hesse Darmstadt.*—Manufacturer.
Press for extracting the juices of herbs and medicinal plants.

209. Probster, —, *Nuremberg, Bavaria.*—Manufacturer.
Specimens of mathematical instruments.

210. Schade, Fead., *Breslau, Prussia.*—Manufacturer.
Mathematical instruments.

211. Pokorny, J. A., *Berlin, Prussia.*—Manufacturer.
Chemical lamps, balances; chemical and pharmaceutical instruments.

212. Wehefritz, Sigmund, *Nuremberg, Bavaria.*—Manufacturer.
Scales of various kinds and capacities.

213. Kisskalt, —, *Nuremberg, Bavaria.*—Manufacturer.
Mathematical instruments.

214. Greiner, F. F., *Stulzesbach, near Ilmenau.*—Manufacturer.
Glass chemical apparatus.

215. Becker, Gustav, *Freiburg.*—Manufacturer.
Eight-day clocks.

[The invention of clocks has been ascribed to Boethius, in 510. The first resembling those now used was made at Bologna, in 1356. Henry de Wyck, a German, made clocks about 1364, the nature of whose machinery is preserved. Clocks were introduced into England in 1368 by Edward III., and became common in the fourteenth century. Pendulum-clocks were invented in 1641, by Richard Harris, of London. To distinguish them from sun-dials, they were at first called "nocturnal-dials."]

216. Friedrick, C. A., *Breslau, Prussia.*—Manufacturer.
Gold calendar, showing the day of the month; eight and fourteen-day clocks; alarm-clocks.

217. Grimm, Gustav, *Koestritz, Prussia.*—Manufacturer.
Tellurians, or instruments illustrating the changes of the seasons.

[The sun is represented by a lamp in the center, around which the earth is made to revolve by machinery under the stand. The instrument also illustrates the phases of the moon.]

218. Gehe & Co., *Dresden, Saxony.*—Manufacturers.
Meissen porcelain pharmaceutical apparatus.

219. Kalb, Jr., J. G., *Nuremberg, Bavaria.*—Manufacturer.
Spectacles, optical-glasses, &c.

220. Broemel, Aug., *Arnstadt, Schwartzburg-Sondershaussen.*—Manufacturer.
Heavy scales and decimal balances.

221. Menke, R., *Bremen.*—Manufacturer.
Chronometer.

222. Nietschmann, F., *Halle-on-the-Saale, Prussia.*—Manufacturer.
Mathematical and drawing instruments.

223. Holzscbuber, Brothers, *Schleiz, Prussia.*—Manufacturers.
Collection of Reaumur thermometers, barometers, and thermometrographs.

224. Gressler, Edward, *Erfurt, Prussian Saxony.*—Manufacturer.
Chemical and physical apparatus; boxes of chemicals; retorts, gasometers, lamps, thermometers, scales; galvanic batteries and apparatus; birds' eyes; test tubes; &c.

225. Spindler, Paul, *Stuttgard, Wurtemberg.*—Manufacturer.
Leveling and mathematical instruments; highly finished. Alarum-watch machine.

226. Breithaupt, Fred. W., & Son, *Cassel, Hessen.*—Manufacturers.
Mathematical and surveying instruments, of high finish.

227. Reimer, Dietrich, *Berlin, Prussia.*—Manufacturer.
Observatory apparatus for seeking stars; globes, common and in relief, showing the oceanic currents and other phenomena of physical geography, brought down to 1853.

228. 3. Products resulting from the use of philosophical instruments.

229. Badeker, J., *Iserlohn.*—Publisher.
Map of America.

230. Wunsche, Moritz, *Leipzig, Saxony.*—Manufacturer.
A variety of surgical instruments, including amputating cases; lithotomy and lithotrity instruments; trepanning instruments; pocket-cases; veterinary instruments; dental instruments; osteotome, a very complicated instrument; eye-cases; scarificators; tonsillotome; forceps and obstetrical instruments: of high finish and of approved forms.

AUSTRIAN EMPIRE.

231. Batka, Wenzel, *Prague, Bohemia.*—Manufacturer.
Chemical and pharmaceutical instruments.

232. Pfleuderer, J., *Stadt Steyer, Austria Proper.*—Manufacturer.
A pair of scales.

232a. Becker, F. G. A.—Manufacturer.
Geometrical models in wood.

233. Pucher, G., *Veldes, Carinthia.*—Artist.
Daguerreotypes on glass.

234. Raffelsperger, Franz, *Vienna.*—Patentee and Printer.
Various maps and charts, in ten languages, namely, English, German, Hungarian, French, Illyrian, Arabic, Italian, Hindostani, Russian, and Servian; printed with ordinary type.

235. Paulino, Jacob, *Vienna.*—Designer.
Section of plastic map of Switzerland.

THE ITALIAN STATES.

236. Asvisio, Gio. V., *Pinerolo, near Turin, Sardinia.*—Inventor and Manufacturer.
A pair of balances of a new invention, the works being hidden in a marble-covered box, like the "balance pendule."

237. Crotti, G., *Turin, Sardinia.*—Manufacturer.
A collection of solid figures, in wood, for geometricians, and for elementary instruction in geometry.

238. Griffoni, Ettore, *Genoa, Sardinia* (from Naples).—Inventor.
Terrestrial globe, of hard wood, exhibiting the seas, rivers, and lakes, in depressions, and the mountains in relief.

239. Tirone, E., *Turin, Sardinia.*—Civil Engineer.
Topographical picture of the Alpine valleys, in water colors.

240. La Marmora (Minister of War), *Turin, Sardinia.*—Exhibitor.
Topographical maps of the Sardinian States.

SWITZERLAND.

241. Enard, E. P., *St. Blaize, Canton Neuchatel.*—Manufacturer.
Three watches.

242. Montandon, Brothers, *Locle, Canton Neuchatel.*—Manufacturers.
Twelve watches, highly finished.

243. Mermod, Brothers, *St. Croix, Canton Vaud.*—Manufacturers.
Fine specimens of gold repeating and chronometer watches, plain and enameled backs.

[The base of all kinds of enamel is pure glass, rendered semi-transparent, or opaque, by the metallic oxyds; white enamel is made by mixing the oxyd of tin with the glass. The colors used for enamel-painting have all a metallic base; the reds being made from the oxyd of gold, greens from copper, yellows from lead, blues from cobalt, &c.]

244. Grandjean, Henri, *Locle, Canton Neuchatel.*—Manufacturer.
Fine watches; pocket and marine chronometers.

245. Paillard, E. & A., Brothers, *St. Croix, Canton Vaud.*—Manufacturers.
Fine gold and enameled watches, chronometers, and musical boxes; enameled and jeweled backs.

246. Lequin & Yersin, *Fleurier, Canton Neuchatel.*—Manufacturers.
Eighteen watches in a variety of styles.

247. Rauss, Jules, *Chaux de Fonds, Canton Neuchatel.*—Manufacturer.
A case of gold engine-turned watches in various styles.

248. Bomaud, E., & Co., *St. Croix, Canton Vaud.*—Manufacturers.
Chronometer and other watches in various styles.

249. Favre & Andrie, *Locle, Canton Neuchatel.*—Manufacturers.
Astronomical timepiece.

250. Favre, Henay August, *Locle, Canton Neuchatel.*—Inventor and Manufacturer.
Watches in various styles; an instrument for astronomical, physical, and geographical observations.

251. Patek, Philippe & Co., *Geneva.*—Inventors and Manufacturers.
Chronometers and watches, repeaters, &c. New, winding up by the pendant; plain, enameled and beautifully pointed, and jeweled backs; independent second-hands. Watch in a heart-shaped locket, of the size of a dime, and one of the same size in a double eye-glass; and a perfect watch, of the size of a three-cent piece.

252. Breitling & Laederich, *Chaux de Fonds, Canton Neuchatel.*—Manufacturers.
Gold and silver watches, and watch-movements.

253. Fatio-Junod, J. H., *Geneva.*—Manufacturer.
Three chronometers, and other watches.

254. Favre-Brand, F. E., *Locle, Canton Neuchatel.*—Manufacturer.
Clocks of various descriptions.

255. Grosclaude, Cil Henri, *Fleurier, Canton Neuchatel.*—Inventor and Manufacturer.
Various watches.

256. Borel, H. J., *Chaux de Fonds, Canton Neuchatel.*—Manufacturer.
Two watches.

257. Racine, John H., *Chaux de Fonds, Canton Neuchatel.*—Manufacturer.
Two enameled dials.

[Surmounted by two magnifiers, which disclose on one, in the hair-line of figure 4, the name of Charles Frederic Racine, quite unnoticed by the naked eye. The other dial has the Lord's Prayer around its circumference, in French—around the second-hand, "I make not the circuit of this narrow face, before some mortal departs, never to return"—around the circle indicating the phases of the moon, "A new world discloses itself to our eyes when we know how to raise the veil which covers it"—around the face indicating the months, "Both heavens and earth present in a single point a wonderful infinite world"—and around the circle showing the days of the month, the same maker's name and residence. All the above is so fine that the unaided eye cannot read it, and would hardly notice any thing but an ordinary divided circle. It is in French.]

258. Borel, Henay G., *Chaux de Fonds, Canton Neuchatel.*—Manufacturer.
Chronometers and dial.

259. Bock, H., *Locle, Canton Neuchatel.*—Manufacturer.
Movements of clocks and watches.

260. Matile, H. L., Jr., *Locle, Canton Neuchatel.*—Manufacturer.
Fine gold chronometer-balance and independent-second watches; two chronometer-movements.

261. Perret, Augustin, *Locle, Canton Neuchatel.*—Manufacturer.
Pocket-chronometer and independent-second watch.

262. Bachelard, D., & Son, *Geneva.*—Manufacturers.
Fine watches.

263. Leresche, A. Golay, *Geneva.*—Manufacturer.
Fine watches; pocket-chronometer; very small watches; plain and enameled backs; showing days and months, with independent-second, indicating one-fifth of a second.

264. Audemars, Louis, *Brassus, Canton Vaud.*—Manufacturer.
Fine watches, chronometers and repeaters, with plain, enameled, and jeweled backs.

265. Barbezat, F. L., *Chaux de Fonds, Canton Neuchatel.*—Manufacturer.
A variety of gold and silver watches.

266. Capt, H., *Geneva.*—Manufacturer.
Fine watches, with plain, enameled, and jeweled backs; some of very small size. Eight-day chronometer, showing the day of the week and month, surmounted by a mechanical singing-bird.

[The manufacture of watches forms one of the principal branches of Swiss industry; it is confined, however, particularly to the cantons of Geneva, Neuchatel, Vaud, and the Bernese Jura. This depends entirely on local circumstances, which, in the cantons of Geneva and Neuchatel, are abundant capital, cheap labor, and absence of other trades, with a natural love and aptitude for fine and delicate work; and, in the Jura, the inclemency of the winters, which force the orderly, patient, and industrious people to in-door employments.

The division of labor is carried to such an extent, that a movement of a watch, worth perhaps twenty-five cents, passes through fifty or sixty hands. The above-mentioned cantons probably manufacture two-thirds of the watches in the world; the total annual number has been estimated at 1,200,000.

The most expensive and finest watches are made in Geneva, as also many chronometers. Watch-cases are chiefly manufactured, and it is calculated that several hundred chasers and many enamel-painters are employed in this work. The small watches mounted in bracelets, &c., are principally made here. In the canton of Neuchatel, the towns of Locle and Chaux de Fonds are the chief localities of the trade; all the valleys surrounding these towns are inhabited by watchmakers and their families. These valleys contain many factories, which however generally manufacture cheap and inferior watches; there are also many factories in which are made the machines and instruments used in the trade, and the articles connected with it, such as dials, hands, springs, keys, &c. Comparatively, few clocks are made. The watches exhibited are of exquisite design and high finish.]

267. Hommel-Esser, F., *Aarau, Canton Argovie.*—Manufacturer.
A case of mathematical instruments in German-silver, one in brass; a reduction-compass, with micrometer.

268. Gysi, Frederic, *Aarau, Canton Argovie.*—Manufacturer.
An extensive variety of mathematical instruments.

269. Rohr, Ferdinand, *Leutzbourg, Canton Argovie.*—Manufacturer.
Several cases of mathematical instruments, in German-silver and other materials, well finished.

270. Keru, J., *Aarau, Canton Argovie.*—Manufacturer.
A large and very complete case of mathematical instruments.

271. Favre-Brand, A., *Locle, Canton Neuchatel.*—Inventor and Manufacturer.
A new compass.

272. Keigel & Petitpierre, *Couvet, Neuchatel.*—Manufacturers.
A new style of compass.

[There are many mathematical-instrument makers in the cantons of Argovie and Geneva, whose instruments are much sought after for their high finish and moderate price.]

273. Daguet, Theodore. *Soleure, Canton Neuchatel.*—Manufacturer.
Crown and flint-glass for optical purposes; objectives, for daguerreotype instruments. The flint-glass is clear, homogeneous, and resists all decomposition from the action of the air.

274. Masset, L., *Yverdon, Canton Vaud.*—Inventor and Manufacturer.
A planetarium.

275. Lombard, A. C., dit Jampenn, *Geneva.*—Inventor and Manufacturer.
Wooden leg, for use in cases of amputation either above or below the knee.

276. Piece, Louise, *Rue Verdaine, Geneva.*—Manufacturer.
India-rubber stockings for varicose veins, knitted in tricot; and a pair of suspenders.

277. Ebersold, Gabriel, *Berne.*—Manufacturer.
Stereometric apparatus, and a variety of linear designs; invalid-chair.

278. Isenring, J. B., *St. Gall, Canton St. Gall.*—Artist.
Various specimens of photography.

THE NETHERLANDS.

279. Uhlman, K. W., *Zwolle, Netherlands.*—Inventor.
An equatorial sun-dial.

280. Becker, C., *Arnhem.*—Inventor.
Balances for analytical purposes.

281. Bruyn, H. W. de, *Leyden.*—Manufacturer.
Large clocks, with striking and alarum mechanism.

282. Kaiser, A., *Hague.*—Manufacturer.
Small counting-house clock, very simple and neat.

283. Oomkens, T., Jr., *Groningen.*—Manufacturer.
Map and atlas of the Netherlands.

SECTION III. CLASS XI.

MANUFACTURES OF COTTON.

The cotton manufacture forms the most important feature of the commercial activity of this country. It is intimately connected with our agricultural prosperity. According to the last census, 641,240 bales of cotton were manufactured in the United States, principally in New England. The value of this amount of cotton was $34,800,000; the capital employed was $74,501,000; and the value of the product, consisting of about 763,000,000 yards of sheetings, shirtings, calicoes, &c., and 27,000,000 lbs. of yarn, was estimated at $61,869,000. The number of persons employed in this manufacture in the United States in the year 1850 was 92,286, of which number 33,150 were males, and 59,136 were females. The wages paid to them monthly amounted to $1,357,192. The State of Massachusetts contains about one-third of the whole number of spindles in the United States; and the other New England States another third; and about one-half of the capital invested in the manufacture is owned in Massachusetts. The cotton manufacture is rapidly increasing; its machinery has been brought to such perfection, and its resources so far developed, that it is quite independent of tariffs, and able to compete successfully with the industry of any other country. Its rapid growth and magnitude are unparalleled, except by the rise of the same manufacture in Great Britain. The first cotton mill with Arkwright's machinery was erected in 1790, in Pawtucket, Rhode Island, by the late Samuel Slater. The first spinning machine was a water frame containing twenty-four spindles; it was on the throstle principle. In striking and gratifying contrast with this humble commencement of the cotton manufacture is the present condition of the city of Lowell. In 1819 the site of Lowell was the resort of sportsmen. It is now occupied by 51 mills, having 342,722 spindles and 10,608 looms, and employing a capital of $13,900,000, under the direction of twelve companies. Nearly all are devoted to the manufacture of cotton.

It is to be regretted that this branch of our own and foreign industry was not more fully represented.

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1. Wamsutta Mills (Thos. Bennet, Jr., Agent), *New Bedford, Massachusetts.*—Manufacturers.

Fine cotton fabrics, various kinds and qualities.

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2. Dudley, J. G., & Co., *New York City.*—Manufacturers and Agents.

Cotton goods, brown and bleached, from the Reading (Pennsylvania) Manufacturing Company.

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3. Gladding, Joseph S., *Moosup, Windham Co., Connecticut.*—Manufacturer.

Cotton fabrics, brown, bleached, and colored.

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4. Saunders Cotton Mills, *Grafton, Massachusetts.*—Manufacturers.

Bale of cotton printing cloths, 64 + 68 and 30 inches wide.

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5. Mason & Lawrence, *Boston, Massachusetts.*—Agents.

Cocheco prints, 26½ to 27 inches wide, count 68 + 72, all madder dyed, made and printed at Dover, New Hampshire.

Salmon Fall sheetings.....count 46 + 50, 37 inches wide, weight 2.77 yards to lb.
" drills ..... " 44 + 43, 30 " " 2.82 "
" cotton flannels . " " " " " "
" wide drills..... " " 37 " " 2.28 "

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6. Buffington, Nathan, *Fall River, Massachusetts.*—Manufacturer.

Specimens of three-cord spool cotton.

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7. Brownell & Co., *Moodus, Connecticut.*—Manufacturers.

Specimens of cotton seine twine.

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8. Nichols, W. E., & Co., *Moodus, Connecticut.*—Manufacturers.

Cotton cords and cotton seine twine.

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9. Boston Duck Company.—Manufacturers.

Specimens of cotton duck.

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10. Glasgow Mills (G. W. Atwater, Treasurer), *Springfield, Massachusetts.*—Manufacturers.

Specimens of ginghams; gingham handkerchiefs; white and colored cotton yarns.

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11. Fitch, Asa, *Fitchville, Connecticut.*—Manufacturer.

Drills and sheetings, bleached, unbleached, and indigo blue.

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12. Atlantic Cotton Mills, *Lawrence, Massachusetts.*—Manufacturers.

Specimens of wide shirtings and sheetings.

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13. Mills, Charles H., & Co., *Boston, Massachusetts.*—Agents.

From the Hadley Falls Mills:
Fine printed lawns, brilliants, cambrics, and jaconets.
From the Great Falls Company:
Fine and heavy bleached shirtings, and Number 43 yarns.
From the Whittenton Mills:
Canada plaids, all cotton.

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14. Canfield, M., & Co., *Cedar Street, New York.*—Agents.

Cotton carpet warp; cotton yarn; seamless bags; cotton battings; Osnaburghs sheetings and shirtings.

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15. Demarest & Joralemon, *Vesey Street, New York.*

Cotton twine for seines; cotton lines for drift and other nets.

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16. Bertine, Peter J. (Executor of D. McEwing), *New York.*

Specimens of book and foundation muslins; mosquito nettings; crown linings; and various kinds of cotton yarns.

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17. Goddard, Brothers, *Providence, Rhode Island.*—Manufacturers.

Various cotton fabrics.

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18. Wortendyke, A., *Godwinville, New Jersey.*—Manufacturer.

Specimens of cotton wick; chandlers' wick; counter-twist wick for patent machine moulds.

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19. Herrick, M. A., *Nashville, New Hampshire.*—Manufacturer.

Specimens of fine sheetings and shirtings.

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20. Flanders, Benjamin & Co., *New York City.*—Agents.

Specimens of cotton duck, manufactured by the Atlantic Duck Company, East Haddam, Connecticut.

21. Taft & Bartlett, *Willimantic, Connecticut.*—Manufacturers.
Six-cord white spool cotton; three-cord colored spool cotton.

22. Manderson & Lammott, *Philadelphia, Pennsylvania.*—Agents.
Cotton bed tickings.

23. Conestoga Steam Mills, *Lancaster, Pennsylvania.*—Manufacturers.
Cotton prints and print cloths; cambrics; brown sheetings; drillings, tickings, and shirtings; canton flannels; cotton counterpanes and blankets.

24. Parker, Wilder & Co., *Boston, Massachusetts.*—Agents.
Specimens of Monadnock bleached sheetings.

25. Masonville Manufacturing Company, *Providence, Rhode Island.*
Cotton sheetings and shirtings.

26. Williamsville Manufacturing Company, *Providence, Rhode Island.*—Manufacturers.
Superfine cottons, extra twist; brown and bleached shirtings.

27. McMullen, John, *Baltimore, Maryland.*—Manufacturer.
Cotton seines and fishing nets.

[This netting is all made by machines having a general resemblance to power-looms, and which are driven by steam-power. The knot is the well-known fisherman's knot, but by the machine it is drawn much more firmly than when made by hand; the netting is also uniform throughout. Two machines, with one person to attend them, make from 1,500 to 2,000 knots a minute.]

28. American Cordage Company, *New York City.*—Manufacturers.
Specimens of patent cotton cordage and rope for rigging, towlines, &c.

[Cotton cordage, and the method of its manufacture, are both new inventions. A machine is made to answer all the purposes of a long rope-walk. Cotton is capable of a tighter twist, and is less injured by friction, than hempen cords. The rope is more pliable and runs more freely through the blocks than hemp rope. The fibres are laid together more compactly and with greater tension by this process than by any other known. The cotton used is a long staple "Macon, Georgia."]

29. Malcolm & Haskett, *Paterson, New Jersey.*—Manufacturers.
Bleached American quilts; drab, all cotton quilts; colored cotton table covers; linen and cotton table covers.

30. Milledgeville Manufacturing Company, *Milledgeville, Georgia.*
Heavy Osnaburghs, of superior quality.

31. Hook, Charles G., *New York City.*—Proprietor.
Fine Marseilles quilts.

32. Nesmith & Co., *New York City.*—Agents.
Sheeting and shirtings, bleached and unbleached; drilling; tickings; and diapers.

33. Merriam, Brewer & Co., *New York and Boston.*—Agents.
Sheetings, drillings, denims, cotton flannels, corset jeans, and ticking.

[These cotton goods are manufactured by the Amoskeag Company, Manchester, New Hampshire. The ACA ticking, one of the earliest cotton fabrics woven in this country, sold forty years ago at 75 cents a yard, is now sold at 16 cents.]

GREAT BRITAIN AND IRELAND.

34. Dawbarn, William, *Wisbech, Cambridgeshire.*—Manufacturer.
Wisbech sheeting; specimens of reel and ball sewing cotton.

35. Brook, Jonas, & Brothers, *Meltham Mills, Huddersfield.*—Manufacturers.
Sewing cottons on spools, and in skeins; cotton cords; cotton wools, exhibiting the various stages of manufacture.

36. Robertson, J., & Co., *Glasgow, Scotland.*—Manufacturers.
Jaconets.

37. Clark, John, *Leicester.*—Manufacturer.
Sewing cotton, upon fancy wood and metallic reels.

38. Clark, Jr., John, & Co., *Mile End, Glasgow.*—Manufacturers.
Spool cotton, white, black, and colored.

39. Ford, Francis, *Stanley Street Mill, Manchester.*—Manufacturer.
Samples of sewing cottons.

40. The Blackhall Company (R. Russell, Manager), *Paisley.*—Manufacturers.
Cotton sewing thread.

41. Paul, James, *Glasgow.*—Manufacturer.
Specimens of ginghams; embroidered muslin robe.

42. Erman, Godfrey, *Manchester.*—Manufacturer.
Sewing cotton, on spools and in skeins.

THE GERMAN STATES.

43. Von Kulmer & Minnei, *Arnsadt.*—Manufacturers.
Ginghams and doileys.

44. Schuffner, C. W., *Chemnitz, Saxony.*—Manufacturer.
Specimens of checked ginghams.

45. Oelsner & Rahlenbeck, *Hohenstein*, near *Chemnitz.*—Manufacturers.
Cotton quilts; cotton hosiery and gloves.

46. Danneberg & Sons, *Eilenberg, Prussia.*—Manufacturers.
Furniture cottons.

47. Schöne, J. G., *Dresden.*—Manufacturer.
Cotton trimmings and tapes; laces, suspenders, and ribbons.

48. Kochlin & Son, *Laerach, Baden.*—Manufacturers.
Cotton goods of various description.

49. Becker & Schraps, *Chemnitz.*—Manufacturers.
Printed cotton fabrics.

50. Neuman, *Berlin.*—Manufacturer.
Cotton plushes of various colors.

51. Bergmann, F. Offenbach, *Hesse Darmstadt.*—Manufacturer.
Cotton canvas.

52. Teltzner, C. A. & Son, *Burgstadt, Saxony.*—Manufacturers.
Cotton fabrics; samples of cotton yarns.

53. Hendel, J. C., *Schwartzenbach, Bavaria.*—Manufacturer.
Cotton goods.

AUSTRIAN EMPIRE.

54. Grillmayer, J., *Linz, Austria.*—Manufacturer.
Samples of cotton twists.

55. Lang, J., *Vienna.*—Manufacturer.
Specimens of fancy cambrics.

56. Jenny & Schindler, *Vorarlburg.*—Manufacturers.
Printed cotton fabrics.

SWITZERLAND.

57. Wolfers, Emben & Co., *New York City.*—Importers.
Muslin fabrics.

BELGIUM.

58. Guequier & Co., *Ghent.*—Manufacturers.
Samples of cotton yarns.

THE NETHERLANDS.

59. Schelleus, J., & Son, *Eindhoven.*
Printed cotton handkerchiefs, East India pattern.

60. Arntsenius, G. A., *Goor.*—Manufacturer.
Cotton shirtings, bleached and unbleached.

61. Vandenberg, J., *Leyden.*—Manufacturer.
Fly nets for open windows.

[The art of manufacturing cotton was derived by Europeans from the Hindoos, who have made cotton cloth from the most ancient times, and still surpass all other nations in the exquisite delicacy of their fabrics. The Mexicans, also, at the conquest of Cortez, were clothed in cotton fabrics of superior beauty and fineness.

All the ordinary cotton fabrics are imitations of the original manufactures of India, and bear the native names of the places where they were once made. Calico is a general name applied to the plain white cloths made from cotton. It is derived from Calicut, from which it was first imported in 1631. As the quality and strength of calico is increased, it is called long cloth, duck, and double warp. Calico shirting is made to imitate linen, which it has superseded. Sheeting is a calico in like manner substituted for linen sheeting. Printed calicoes, or briefly, prints, were originally imitations of Indian fabrics, but have long been produced in infinite variety and quality. In the United States the term calico is restricted by popular usage to prints. Chintz is a variety of print in which the figure has at least five different colors. They often possess great beauty of design and richness of color.

Muslin is distinguished from calico by no essential difference, except its superior fineness. The name is supposed to be derived from Masulipatam, from which place muslins were first imported. The Indian muslins are made of a tissue so exquisite as to justify the name given them in the East, "webs of woven wind." Of a specimen in the museum of the East India Company, twenty yards of the yarn weighed only a grain; a pound would have reached 115 miles. In England yarn has been spun so fine that a pound would extend 167 miles; but this could not be woven by machinery. Though some machine-made muslins are finer than those of India, they are less rich, soft, and durable.

Jaconet is a light, open, and soft kind of muslin, but stouter than mull. The name is thought to be a corruption of Jaghernout. Mull is a very thin and soft muslin used for dresses and trimmings. Buke, or book muslin, is plain and clear, woven for working in the tambour. Foundation muslin is open, and used for stiffening bonnets and dresses. Leno is a thin gauze used for window blinds. Cambric is an imitation of linen cambric; its varieties are glazed, white, and colored for linings; twilled, figured, striped, and corded. Cord and fancy check muslins are cambrics marked with cords and stripes, by heavy threads introduced in the warp and weft. Figured muslins are woven in the loom to imitate tamboured muslins which are embroidered by hand. Cotton cambrics are either printed for dresses, or used as French cambric.

Cotton damasks, diapers, etc., are made to imitate linen fabrics of the same name. Cotton ticks are plain or twilled, and sometimes composed partly (union tick) of linen. Ginghams are thin checked cottons. Counterpanes (counterpoint) are woven with little protuberances of various patterns. A more elegant species is the Marseilles quilts. These have a double cloth, with a softer fabric quilted between them in the loom. Jeans are twilled cottons; satin jeans have a glossy satin surface, and are used for stays. Dimity, a curtain fabric, is both plain and striped. Fustian is a coarse, stout, twilled fabric, including many varieties, as corduroy, jean, velveteen, thickset, etc. Plain fustian is called pillow; strong-twilled fustian, cropped before dyeing, is called moleskin, when cropped after dyeing, beaverteen.

The downy fibres of the web, as it comes from the loom, are removed from the finer kinds of cotton goods by passing the web rapidly over a semi-cylindrical red-hot iron placed horizontally. The iron has been replaced by a gas-tube, pierced on its upper surface with numerous minute orifices for jets of gas.]

SECTION III. CLASSES XII. & XV.

WOOLLEN AND WORSTED FABRICS.

The two classes, comprising woollen and worsted fabrics, are arranged together in the catalogue on account of the difficulty, or rather impossibility of separating them. Many manufacturers make both classes of goods, and the mixed fabrics are usually made to imitate all wool goods. These classes are largely represented in the exhibition.

In the United States the manufacture of wool stands next to that of cotton, as an important branch of national industry. It employs a capital of about $28,000,000; and with an annual consumption of 71,000,000 lbs. of wool, worth $25,000,000, its production is valued at $43,000,000. The number of work-people employed is about 40,000, and their monthly wages amount to $700,000, being rather more than half the sum paid in the cotton manufacture. The woollen manufacture of the United States is more generally distributed than the cotton manufacture. Yet Massachusetts employs in it one third of the whole capital, and consumes one third of the wool. New York, Pennsylvania, and Ohio, however each consume a larger proportion than of cotton. The manufacture is rapidly extending in the United States, and every year furnishes examples of an application of new processes and a production of new results, while there are yet important classes of fabrics of wool which have not been attempted in this country or only to a very trifling extent, when compared with the importations.

The woollen manufacture of England is one of the oldest and most important of the kingdom, employing over 300,000 operators, and producing annually goods to the value of $120,000,000. The manufacture is singularly distributed in various parts of England, particular localities being recognised as the head quarters of the various branches of the business. The finer broadcloths are produced in the West of England, at Stroud, Frome, Chippenham, Tiverton, and Bradford; worsted goods of various qualities, or the product of the long English wool, combed and spun to a smooth thread and not felted, for ladies dresses, &c., at Bradford, in Yorkshire, and the surrounding villages; heavy cloths for over-coats, &c., at Leeds; pantaloon stuffs and vestings at Huddersfield; blankets at Dewsbury; carpets and damasks for furniture at Halifax—all in Yorkshire—and tweeds, tartans, shawls, &c., at Galashiels and Hawick, while the imitation cashmere shawls are largely produced at Paisley, in Scotland.

F'annels are very largely produced in Wales, and also at Rochdale, near the borders of Lancashire and Yorkshire; and many heavy goods, such as blankets, horse cloths, &c., in Oxfordshire, at Witney (whence Witney blankets), Chipping Norton, and at Kendal, in Westmoreland.

The growth of the worsted business at Bradford has been equal in its rapidity to anything in America. The population of Bradford in 1800 was about 6,400; in 1831, 23,000; in 1841, 66,708; in 1851, 103,782. This great increase is due to the growth of the manufacture of worsted goods, and of goods mixed with cotton and silk, as well as of the alpaca wool, all of which articles are very largely produced there, and form an important portion of the exports of England to this country, amounting at present in value to about $6,000,000.

Another large item of our imports from England is the coarse cloth over-coats, made in the neighborhood of Leeds and Dewsbury, from *shoddy*, or old rags, torn up in a "*devil*," as it is technically termed, and re-spun into yarn, with the addition of a little fresh wool.

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1. Gilbert, George H., *Ware, Massachusetts.*—Manufacturer.

Four pieces all wool flannel, and two pieces all wool gauze flannel, manufactured from American wool; two pieces silk warp flannel and two pieces silk warp gauze flannel, with filling of American wool.

2. Morrison, Alva, *Braintree, Mass.*—Manufacturer.

Specimens of woollen-stocking yarns.

3. Stewart, A. T., & Co., *New York City.*—Importers.

Heavy beaver cloths; fine all wool blankets.

4. Lounsbury, Bissell & Co., *Norwalk, Conn.*—Manufacturers.

Woollen felt beavers from the Winnipank Mills.

5. Barnes, Bowers, & Beekman, *New York City.*—Agents.

Specimens of fine broadcloths, tweeds, cassimeres, satinets, and merino cassimeres.

6. Union Manufacturing Company, *Norwalk, Conn.*

Worsted felt beavers, and other worsted felt goods, made from a series of thin sheets of worsted, without spinning and weaving.

[These goods are manufactured by a process new as applied to cloth, but essentially the same as that formerly used for hat bodies, and still used in making the felt hats worn by travellers. The process consists in carding the wool and delivering it in the form of a fine batt or lap, which is immediately converted into cloth by a peculiar rubbing that causes the interlocking of the fibres (felting) without going through the usual process of spinning. The process is peculiarly valuable for heavy cloths, in which resistance to water is a desired quality.]

7. Bush & Munkittrick, *New York City.*—Agents.

Fancy cassimeres, manufactured by the Broadbrook Company; doeskin and fancy cassimeres, manufactured by Wetbered, Brothers, Maryland; fancy cassimeres of various colors, manufactured by Manufacturing Company, Melville, Mass.

[These goods constitute a very important branch of American manufacture. They are designed expressly as pantaloon cloths, and, except in the case of black cassimeres, have almost entirely monopolized that branch of the cloth trade. The newer and more costly styles are, to a certain extent, imported every year, but they are instantly imitated by American manufacturers at about half the cost and scarce any difference in quality.]

8. Slade, John, & Co., *New York City.*—Agents.

All wool flannels, and silk and wool flannels, from the Ballard Vale Company, Mass.; fine black cassimeres, from the Alderbrook Mill, Eaton, N. Y.; fancy tweeds, all wool, from the Dexter Manufacturing Company, Oriskany, N. Y.; fine cassimeres, and silk warp Codringtons, from the Salisbury Manufacturing Company.

9. McGregor, Timpson, & Co., *New York City.*—Agents.
American cashmerets of extra fineness.

10. Nesmith & Co., *New York City.*—Agents.
Specimens of blankets, flannels, and other woollen fabrics.

11. Perkins Mills, *Akron, Ohio.*—Manufacturers.
Samples of fine satinets.

12. Bassett, D., & Co., *Lee, Mass.*—Manufacturers.
Samples of fine satinets.

13. Lawrence, Stone, & Co., *Boston.*—Agents and Manufacturers.
Square and long shawls, and embroidered merino shawls; specimens of blankets, colored flannels, woollen plaids, fine cassimeres, &c., manufactured at the Bay State Mills; doeskin and fancy cassimeres, manufactured by the Middlesex Company.

[The Bay State Mills form the largest establishment for the manufacture of woollens in the United States, and probably in the world, having a capital of $2,000,000, and employing 2500 operatives. The fine colored flannels which they exhibit, they were the first to produce in this country, and the beaver cloths and cassimeres will compare with the best on exhibition. The striking feature of this establishment, however, is their stock of plaid shawls, a branch of manufacture which they introduced in 1848, and which they have carried to a production of 300,000 shawls in 1853. This result was accomplished by the invention of new and important machinery for many branches of the manufacture—twisting the fringes, for example—thus accomplishing by machinery, at a very small cost, what had previously been done by hand. The machine for twisting the fringes was the invention of Mr. Milton D. Whipple, a very ingenious and intelligent mechanic, of Lowell, Mass., and the accuracy and ease with which it performs its labor is only to be imagined by those who have seen it in operation.]

14. Almy, Patterson, & Co., *New York City.*—Agents.
Black cassimeres.

15. Harris, Edward, *Woonsocket, Rhode Island.*—Manufacturer.
Specimens of fine cassimeres.

16. Parker, Wilder, & Co., *Boston, Mass.*—Agents.
Extra superfine Cocheco blankets; specimens of Eagle cashmerets.

17. Talcott, John, *West Hartford, Conn.*—Manufacturer.
Samples of superfine knitting yarn, of various colors.

18. Vassalboro' Manufacturing Company, *North Vassalboro', Maine.*
Specimens of cashmeres.

19. Derby, F., & Co., *New York City.*—Agents.
Specimens of black cloths, manufactured by Messrs. Slater & Sons, from American wool; patent wool beaver cloths, impervious to rain, but free for perspiration; elastic summer woollen goods; samples showing the various stages of the manufacture of woollen cloths; cashmere waistcoatings and pantaloon stuffs.

20. Plantner & Smith, *Lee, Mass.*—Manufacturers.
Fancy cassimeres, doeskins, and satinets.

[These goods are very largely worn by the laboring part of the community, taking the place of the fustians or velveteens worn in Great Britain. The warp of satinet is cotton, and the filling is, to a large extent, the short waste of other branches of the woollen manufacture. This is mixed with a sufficient portion of long wool to enable it to be spun, and after being woven in a peculiar way, so as to bring the wool to the face of the cloth, it is then felted heavily, and the cotton is entirely hidden by the wool. It forms a very cheap and durable fabric, and is an important branch of manufacture.

21. Seagrave, J. T., & Co., *Burrillville, Rhode Island.*—Manufacturers.
Fancy cassimeres and doeskins.

22. Hotchkissville Manufacturing Company.
Woollen shawls, richly printed.

23. Roy, James, & Co., *Watervliet Mills, New York.*—Manufacturers.
Plaid woollen long shawls; worsted shawls, printed and embroidered.

24. Marsh, George W., *Pascoag, R. I.*—Manufacturer.
Cotton warp fancy cassimeres.

25. Stevens, Charles A., *Ware, Mass.*—Manufacturer.
Silk warp and all wool flannels.

26. Pomeroy, T., & Sons, *New York City.*—Manufacturers.
Cotton warp broadcloths.

GREAT BRITAIN AND IRELAND.

27. Dewar, D., & Sons, *Kings Arms' Buildings, London.*—Manufacturers.
Table and pianoforte covers, richly printed and embossed.

28. Bliss, William, *Chipping Norton, Oxfordshire.*—Manufacturer.
Kersey checks for horse clothing, summer and winter tweeds, woollen shawls, beaver cloths, press bagging, and saddler's serges.

29. Early, Edward, *Whitney, Oxfordshire.*—Manufacturer.
Whitney blankets, made from English wool.

30. Wilson, George, *Hawick, Scotland.*—Manufacturer.
Shepherd plaids, tweeds, and travelling plaids.

31. Bull & Wilson, *St. Martin's Lane, London.*—Designers and Manufacturers.
Fancy cassimeres, cloths, and beavers.

32. Brown, J. & H., & Co., *Ettrick Mills, Selkirk.*—Manufacturers.
Scotch tweeds and fancy woollens.

33. Sykes, David, *Leeds, Yorkshire.*—Manufacturer.
Black cloths.

34. Craven & Harrop, *Bradford, Yorkshire.*—Manufacturers.
Silk, cotton, and wool damasks; alpacas; dresses of alpaca and crape cloth.
[For engravings of designs of these damasks see Illustrated Record, page 26.]

35. Pease, Henry, & Co., *Darlington, Durham.*—Manufacturers.
Worsted yarns and piece goods.

36. York & Sheepshanks, *Leeds.*—Manufacturers.
Specimens of fine woollen cloths.

37. Burgess, Alfred, & Co., *Bath lane, Leicester.*—Manufacturers.
Various kinds of woollen yarns; samples showing wool in its various stages of manufacture.

38. Middleton & Ainsworth, *London and Norwich.*—Manufacturers.
Figured barege dresses, and corded and brocaded poplins; superfine silk warp paramatta cloth.

39. Jones, Richard, & Co., *Surrey and London.*—Manufacturers.
Felt cloth for piano hammers and dampers, of various thickness; doeskins; felt hats.

40. Pim, Brothers, & Co., *Dublin.*—Designers and Manufacturers.
Single and double poplins; watered and gold double poplins; corded poplins; Scotch plaid, figured, and antique poplins; fancy poplin vestings; white tissue brocade, and glacé silks, of various mixed shades.

41. Dobson, John & Adam, *Innerleithen, Scotland.*—Manufacturer.
Fancy long woollen plaid shawls.

42. Saxton, Alfred, *Nottingham.*—Manufacturer.
Jacquard and embroidered shawls, table covers, gloves, &c.

43. Abercrombie & Yuill, *Paisley, Scotland.*—Manufacturers.
A great variety of printed, square, and long shawls; imitation cashmere and plaids.

BRITISH COLONIES—CANADA.

44. Tetu, Joseph, *Berthier, Canada West.*—Manufacturer.
A piece of mixed woollen cloth, a woollen counterpane, blue and white woollen check, and woollen plaids.

45. Beaudoin, F. X., *St. Henri, Canada East.*—Manufacturer.
A piece of mixed flannel; gray freize cloth (*étoffe du pays*), and woollen plaids.

46. Morin, Jacques, *St. Henri.*—Manufacturer.
A piece of mixed striped cloth; samples of white wool and blue cloth, and blanket.

47. Lameureux, Madame, *St. Henri.*—Manufacturer.
A white knitted and a woollen plaid shawl.

48. Aubé, Madame, *St. Jervais, Canada East.*—Manufacturer.
A knitted woollen shawl.

49. Bouchard, Madame, *St. Valière, Canada East.*—Manufacturer.
A plain shawl.

50. Campeau, Madame, *St. Jervais.*—Manufacturer.
A knitted woollen shawl; a piece of blue cloth, and one of plaid.

51. Picard, Madame S., *St. Pierre, Canada East.*—Manufacturer.
A woollen plaid shawl; a card containing forty shades of worsted; a blanket and plaid counterpane.

52. Martel, Miss P., *St. Ambroise, Canada East.*—Manufacturer.
A knitted woollen shawl.

53. McDonald, Mrs., *Portneuf, Canada East.*—Manufacturer.
A black and gray woollen shawl.

54. Bouchard, Madame I. B., *Quebec.*—Manufacturer.
Samples of white and colored worsted yarn; samples of flannel and worsted goods.

55. Andy, Faançois, *St. Aureline.*—Manufacturer.
A blanket

56. Paradis, François, *Canada East.*—Manufacturer.
A piece of flannel.

57. Quebec Local Committee.
A piece of blue cloth.

58. Clark, W. A., *Toronto.*—Manufacturer.
Samples of clouded blue, grey, white, and superfine white knitting yarns.

59. Patterson, J., *Elgin Mills, Dundas.*—Manufacturer.
Specimens of woollen blankets.

FRANCE.

60. Aubert, Nicholas, Sen., *Lyons.*—Manufacturer.
Imitation blond veils, scarfs, mantillas, robes, and various other fabrics.

61. Steiner, Charles, *Ribeauville, Haut-Rhin.*—Manufacturer.
Plain cotton fabrics, dyed Turkey-red; shawls and handkerchiefs of the same color.

62. Hennequin, H., & Co., *Paris.*—Manufacturers.
Various styles of shawls.

63. Sirot & Co., *Paris.*—Manufacturers.
Specimens of fine square and long cashmere shawls, of various colors.

64. Hartweck, E, *Paris.*—Manufacturer and Designer.
Specimens of shawls, and patterns for shawls.

65. Rouques, A., *Clichy la Garrenne, near Paris.*—Manufacturer.
Superfine cashmeres, of all colors.

66. Fanfernot & Dulac, *Belleville, Seine.*—Manufacturers.
Specimens of table covers.

67. Paret, *Sedan, Ardennes.*—Manufacturer.
Specimens of broadcloths, satins, and kerseymeres.

68. Marechal, T., & Sister, *Sedan.*—Manufacturers.
Samples of woollen cloths.

69. Dietch, T. G., & Co., *Strasburg, Bas-Rhin.*—Manufacturers
Specimens of fine kerseymere cloths and zephyr cloths, of various colors.

70. Sentis, Son, & Co., *Rheims.*—Woolspinners.
Specimens of woollen and worsted yarns.

71. Chenest & Buisson, *Bischeville, Bas-Rhin.*—Manufacturers.
Samples of fine black and blue Amazon cloth.

72. Bacot & Son, *Sedan, Ardennes.*—Manufacturers.
Specimens of fine cassimere.

73. Desmares, T. T., *Vire, near Lyons.*—Manufacturer.
Blue Napoleon cloth, and bronze-colored cloth.

74. Legrix & Brugant, *Rue de l'Hospice, Elbeuf.*—Manufacturers.
Various cassimeres and vestings.

75. Wattine-Prouvast, *Roubaix, Nord.*—Manufacturer.
Rich satin cloths, of various colors.

76. Grosjean, Hofer.—Manufacturer.
Mousselines-de-laine.

THE GERMAN STATES.

77. Schlief, E. P., *Guben, near Berlin.*—Manufacturer.
Specimens of black cloth.

78. Haberland, G. A., *Finsterwalde, Prussia.*—Manufacturer.
Black cloths.

79. Meissner, F. T., *Grossenhayn, Saxony.*—Manufacturer.
Superfine thin black cloths; olive, blue, and bronze cloths.

80. Mueller, A. F., *Mülhausen, Prussian Saxony.*—Manufacturer.
Fancy coatings and buntings.

81. Schlief, Samuel, *Guben, near Berlin.*—Manufacturer.
Black cloths, exhibited for beauty and cheapness.

82. Broesel, Edward, *Greiz, Reuss.*—Manufacturer.
Various colored thibets, mousselines-de-laine, and other worsted fabrics.

83. Moranu & Co., *Greiz, Reuss.*—Manufacturers.
Comb-wool stuffs, mousselines-de-laine, drap d'été, and cuir-de-laine.

84. Schwedler & Son, *Leipsic.*—Manufacturer.
Buckskins and printed table covers.

85. Straess & Loeschner, *Glauchau, Saxony.*—Manufacturers.
Fine worsted fabrics; mixed, and all worsted goods; lama, with thread naps.

86. Busse, Brothers, *Potsdam, near Berlin.*—Manufacturers.
Fine cloths, of various colors.

87. Fiedlers, F., *Oederan, Saxony.*—Manufacturer.
Fine broadcloths.

88. Kenzel & Birknee, *Crimmitzchau, Saxony.*—Manufacturers.
Fine buckskin cloths.

89. Schweitzer & Heller, *Greitz, Reuss.*—Manufacturers.
Black thibet cloth; cashmeres, of different colors; mandarines.

90. Boettger, B., Jr., *Leissnig, Saxony.*—Manufacturer.
Fine woollen cloths.

91. Hilger, Brothers, *Lenness, Rhenish Prussia.*—Manufacturers.
Fine twilled cloths from German wool.

92. Feaux & Riedel, *Aix-la-Chapelle.*—Manufacturers.
Various woollen goods; black royal cashmere.

93. Geissler, Ernst, *Görlitz, Saxony.*—Manufacturer.
Woollen cloths, of various colors.

94. Schimpff & Gladitsch, *Gera, Saxony.*—Manufacturers.
Specimens of fine thibet cloths.

95. Strom, Adam, & Son, *Burtscheid, Rhenish Prussia.*—Manufacturers.
Cloths for billiard tables.

96. Ludwig & Samson, *Silesia.*—Manufacturers.
Superfine cloths.

97. Nellesson, C., *Aix-la-Chapelle.*—Manufacturer.
Specimens of superfine cloths.

98. Feller & Son, *Guben.*—Manufacturers.
Variety of cloths.

99. Weissflag, E. F., *Gera, Reuss.*—Manufacturer.
Merinoes, mousselines, and satins-de-laine.

100. Gevers & Schmidt, *Görlitz, Saxony.*—Manufacturers.
Broadcloths, black and colored; broad buckskin.

101. Meyer, J. B., *Grünberg, Prussia.*—Manufacturer.
A variety of woollen cloths.

102. Forstman & Huffman, *Werden-on-Ruhr, Prussia.*—Manufacturers.
Black and green cloths

103. Pintus, Jr. H., & Co., *Brandenburg-on-the-Havel, Prussia.*—Manufacturers.
Embroidered lama, cashmere, chine, and other goods, made from carded yarns.

104. Haussman, Aug., *Brandenburg-on-the-Havel.*—Manufacturer.
Fine cloths for ladies' mantles.

105. Ruffer, S. B., & Son, *Liegnitz, Prussia.*—Manufacturers.
Imperial woollen cloths, of superfine quality.

106. Mulberger, L. W., *Erbach, Hesse-Darmstadt.*—Manufacturer.
Cloths and buckskins.

107. Brehme & Son, *Weida, Saxe-Weimar.*—Manufacturers.
Cloths and figured doeskins; cassinets.

108. Haslicht, Heinrich, *Brunswick.*—Manufacturer.
Woollen coatings and beaver cloths.

109. Petgold, Fred., *Lingenfeld, Bavaria.*—Manufacturer.
Fine black cloth.

110 Marbach & Weigel, *Chemnitz, Saxony.*—Manufacturers.
Tartans, lamas, &c.

111. Wolf, J. G., *Kirchberg, Saxony.*—Manufacturer.
Woollen cloths—black, scarlet, and crimson—of various qualities.

112. Loewen, S., & Co., *Brandenberg-on-the-Havel.*—Manufacturers.
Woollen figured goods for ladies' cloaks.

113. Braun, Johannes, *Nördlingen, Wurtemberg.*—Manufacturer.
Blankets and table covers.

114. Beyschlag, A. F., *Nördlingen.*—Manufacturer.
Specimens of moltons.

115. Munsch, F., *Nördlingen.*—Manufacturer.
Specimens of moltons.

116. Ehrhart & Wieland, *Lambrecht, Prussia.*—Manufacturers.
Broadcloths.

117. Groehe & Son, *Görlitz.*—Manufacturers
Specimens of woollen cloths.

118. Zschille, O. C. & H., *Frankfort-on-the-Oder.*—Manufacturers.
Saxony fine cloths; blue and black doeskins; satins, &c.

119. Schoeller, Leopold, & Sons, *Duren, Prussia.*—Manufacturers.
Woollen cloths.

120. Fleck, John F., *Saxony.*—Manufacturer.
Specimens of superfine satin broadcloth.

121. Borman, F. A., *Goldberg, Silesia.*—Manufacturer.
Specimens of cloths.

122. Bergmann & Co., *Berlin.*—Manufacturers.
Samples of fine Berlin zephyr worsted yarns, of nearly 1500 different tints.

123. Marx & Weigert, *Berlin.*—Manufacturers.
Plush, velvets, and cashmere shawls, of various colors and designs.

121. Cohn, Philip, & Co., *Berlin.*—Manufacturers.
Shawls of woollen, and half-woollen, and mixed with silk and cotton; plaid patterns.

125. Fudickar, H., *Elberfeld, Prussia.*—Manufacturer.
Horsehair cloths, with silk and cotton plush, for upholstery.

126. Beyer's Widow, & Co., *Zittau, Saxony.*—Manufacturers.
Linen and cotton damask table and tray cloths; table napkins, and doileys.

127. Koechlin, P., & Sons, *Loarrach, Prussia.*—Manufacturers.
Woollen shawls and cottons.

128. Busse, Bernhard, *Leipsic, Saxony.*—Manufacturer.
Damask curtains.

129. Tischendorf, W., & Co., *Collenberg, Prussia.*—Manufacturers.
Vestings, quiltings, and cassimeres.

130. Simon, Moritz, Jr., *Brandenberg.*—Manufacturer.
Almaviva cloths.

131. Spielberg, Franz, *Leipsic, Saxony.*—Manufacturer.
Damask and other half-wool furniture coverings.

132. Priebs, Edward, *Leipsic.*—Manufacturer.
Half-silk damasks.

133. Ambronn & Schreiber, *Penig, Saxony.*—Manufacturers.
Utrecht velvets and woollen cloths; specimens of printing on cotton and wool.

131. Cohen, S., Arnstein, & Co., *Elberfeld, Prussia.*—Manufacturers.
Cashmeres and quilted vestings.

135. Schuffner, C. W., *Glauchau, Saxony.*—Manufacturer.
Furniture damask and table covers.

136. Stzig, Adolph, *Berlin.*—Manufacturer.
Specimens of fancy vestings.

137. Kauffmann, Hermann, *Berlin.*—Manufacturer.
Printed furniture and livery plushes, in mohair, worsted, and cotton; cotton velvets.

138. Schiffner & Zimmermann, *Glauchau, Saxony.*—Manufacturers.
Varieties of mixed, worsted, and silk stuffs.

139. Grafe & Neviandt, *Elberfeld.*—Manufacturers.
Specimens of cashmere vestings.

140. Lang, H., *Plauen, Saxony.*—Manufacturer.
Brocades and chintz furniture goods.

141. Louse, Edward, *Chemnitz, Saxony.*—Manufacturer.
Curtain and furniture damasks.

142. Albrecht, Robert, *Chemnitz, Saxony.*—Manufacturer.
Furniture and table covers in silk, wool, cotton, and mixed goods.

143. Fasch, G. A., *Glauchau, Saxony.*—Manufacturer.
Specimens of mixed wool and silk goods.

THE AUSTRIAN EMPIRE.

141. Bossi, Joseph, *Vienna.*—Manufacturer.
A great variety of long and square barege, satin, and cashmere shawls; mousselines-de-laine.

145. Jenny & Schindler, *Hard, Voralburg.*—Manufacturers.
Specimens of shawls; printed mousselines-de-laine.

146. Kanitz, C., *Vienna.*—Manufacturer.
A variety of shawls.

147. Echinger, Brothers, *Vienna.*—Manufacturers.
Samples of vestings.

148. Kumpan, Ig., *Vienna.*—Manufacturer.
Assortment of broché shawls.

149. Kral, A., *Vienna.*—Manufacturer.
Vestings, of various kinds.

150. Bienert, Florian, *Vienna.*—Manufacturer.
Samples of vest and pantaloon stuffs.

151. Fial, J., *Vienna.*—Manufacturer.
Samples of vestings.

152. Rockstroh, H., *Vienna.*—Manufacturer.
Samples of vestings.

153. Bueroer & Co., *Vienna.*—Manufacturers.
An assortment of shawls.

154. Willfort, A., *Vienna.*—Manufacturer.
Mousselines-de-laine.

155. Stepanek, D', *Bruck, Styria.*—Manufacturer.
Gray Styrian weaver cloth.

BELGIUM.

156. Schmidt & Co., *Brussels.*—Manufacturers.
Pantaloon stuffs.

157. De Moor Muys, *Loperen.*—Manufacturer.
Shawls and plaids for dresses.

158. Keyser, Michel de, *Brussels*—Manufacturer.
Specimens of various woollen fabrics.

159. Simonis, Juan, *Verviers.*—Manufacturer
Specimens of fine broadcloths of various colors.

160. Bergé, Verdure, *Tournay.*—Manufacturer.
Cloths.

THE NETHERLANDS.

161. Geurels, W. O., *Ootmarsum.*—Manufacturer.
Fine wool blankets.

162. Zuurdeg, J., & Son, *Leyden.*—Manufacturers.
Blankets made of Dutch wool, of fine texture, and of fast colors.

163. Visser, E. E., *Amersfoort.*—Manufacturer.
Specimens of blankets.

164. Hoogeboom, J. H., & Son, *Leyden.*—Manufacturers.
Blankets made of fine Dutch wool.

165. Zaalberg, J. C., & Son, *Leyden.*—Manufacturers.
Specimens of blankets for exportation.

166. Van't-Hooft, Widow of F., *Leyden.*—Manufacturer.
Specimens of worsteds.

167. Krantz, L. J., & Son, *Leyden.*—Manufacturers.
Specimens of fine broadcloths.

168. Pols, J., *Leyden.*—Manufacturer.
Assortment of blankets.

169. Schober & Son, *Utrecht.*—Manufacturers.
Variety of woollen yarns.

SECTION III. CLASS XIII.

MANUFACTURES OF SILK.

1. Gurney & Co., *New York City.*—Manufacturers.
Specimens of silk twist in balls.

2. Eagle Manufacturing Co. (J. P. Humaston, Sup.), *Seymour, Conn.*
Silk brocatelles for drapery; set of furniture covered with the same; linings for carriages, &c.

[These are particularly interesting from being entirely the production of the power-loom, whereas all the imported fabrics of a similar kind are woven by hand. The loom used is the invention of E. B. Bigelow, Esq., of Boston, Mass., and will be referred to again in connection with Class 19.]

3. Crossley, Charles W., *New York City.*—Manufacturer.
Specimens of silk in all stages of its manufacture; sewing silks in gum, and dyed in hanks; sewing silks in skeins and spools; twist and embroidery silks; drapery tassels, and all upholstery trimmings; fine trimmings for ladies' dresses, of all descriptions.

4. Neustœdter, Jacob, *New York City.*—Manufacturer.
Upholstery silk damasks; rich woven brocades of modern styles and of the middle ages; church ornates.

5. Newport Silk Factory, *Newport, Ky.*—Manufacturers.
Specimens of silk fabrics.

6. Wright, S., & Son, *Philadelphia, Penn.*—Manufacturers.
Oiled silks.

7. Hayward, George M., *New York City.*
China raw and thrown silk and silk fabrics.

GREAT BRITAIN AND IRELAND

8. Hamilton, Hyde & Co., *7 Finsbury place South, London.*
Window valence, chintz hangers, and ornaments; fancy silk fringes, gimps, curtain cords, &c.

9. Walters, S., & Sons, 15 *Wilson street, London.*—Manufacturers.
Specimens of plush for bonnets, cloaks, and trimmings.

10. Hall & Nichols, 42 *Noble street, London.*
Fancy silk trimmings, braids, gimps, fringes, tassels, girdles, and sewing silk.

11. Booth & Pike, 43 *Oldham street, Manchester, England.*—Manufacturers.
Imperial plush for hats, bonnets, &c., tips for hat linings, galloons, hat bands, &c.

12. Gaosvenor, Wm., *Kidderminster, England.*—Manufacturers.
Silk brocade, brocatelle, and figured damask.

13. Houldsworth, J., & Co., *Portland street Mills, Manchester, England.*—Designers and Manufacturers.
Rich figured silk fabrics, brocades, satins, &c. (See engravings in the "Illustrated Record," page 170–1.

14. Coventry Ribbon Manufactory, *Coventry, England.*
Patterns of ribbons.

15. Milson & Clarke, 36 *Spring Garden, Manchester, England.*—Manufacturers.
Variety of silk fabrics.

16. Courtauld, Samuel, & Co., *Carey lane, London.*
Black and colored crapes.

17. Grout, J., & Co., *Foster lane, London.*—Manufacturers.
Folded and rolled crapes, and gauzes in many varieties.

18. Brown, Wm., *Halifax, England.*—Manufacturer.
Rich figured silk fabrics, brocades, table covers, &c.

FRANCE.

19. Donat, A., & Co., *Lyons (Rhone).*—Manufacturers.
A variety of fancy stuffs for ladies' hats.

20. Huber, A., & Co., 2 *Rue du Braque, Paris.*
Silk plush for hats.

21. Michelin, Theodore, 139 *Rue Montmartre, Paris.*—Manufacturer.
Samples of silk and velvet ribbons.

22. Grellou, Henry, 84 *Rue Rambuteau, Paris.*
Samples of silk buttons, of various kinds, sewed upon satin.

23. Bonnal, V., & Co., *Montauban, Tarn and Garonne.*—Silk Throwster.
Samples of white and yellow raw silk; unbleached silk; cloth for bolting flour.

24. Leblond, F. J., 12 *Rue Mauconseil, Paris.*—Manufacturer.
Samples of patent silk buttons.

25. Boggio, Prosper, & Co., *St. Étienne.*—Manufacturer.
Striped velvets, watered taffetas, black velvets, watered galoons, embroidered velvets, trimmings, &c.

26. Maupin, Girard & Houdard, *Lyons.*—Manufacturers.
Rich dress silks, of various descriptions, watered, colored, and embroidered.

27. Chilliat, Edouard, 127 *Rue St. Denis, Paris.*
Samples of sewing, embroidery, and netting silks, of all shades.

28. Thomas, Brothers, *Avignon.*—Manufacturers.
Specimens of white, cherry, azure, and rose-colored Florence silks; specimens of ruby, black, white, and rose-colored satins.

29. Musy & Galtier, 2 *Place Croix Paquet, Paris.*
Specimens of purple, violet, maroon, and black velvets; dressed velvets; black serge.

30. Montessuy & Chomer, 25 *Place de la Comédie, Lyons.*—Manufacturers.
Plain silks, tartan silks, silk muslins, crapes, tulles, &c

31. Brosse & Co. (Association of Velvet Workers), 1 *Rue de Lorrette, Lyons.*
Velvet stuffs and ribbons.

32. Stewart, A. T., & Co., *New York City.*—Importers.
Rich silk goods.

33. Lambert, Edward, & Co., *New York City.*—Importers.
French embroidered silks.

THE GERMAN STATES.

34. Mengen, Christian, *Viersen, near Crefeld, Prussia.*—Manufacturer.
Velvets and half woollen stripes; embroidery canvas; velvet, silk, and cotton damask furniture covering.

35. Jacobs & Bering, *Crefeld, Prussia.*—Manufacturer.
Silks, satins, and umbrella stuffs.

36. Scheibler & Co., *Crefeld, Prussia.*—Manufacturer.
Velvet ribbons; stamped velvet scarfs; velvets, plushes, and watered silks; lutestrings and serges.

37. Menghius Brothers, *Aix-la-Chapelle, Prussia.*—Manufacturers.
Silk and terry velvets, of various colors; stamped moleskins, ribbons, &c.

38. Diergardt, *Viersen, near Crefeld, Prussia.*—Manufacturers.
Specimens of silks and velvets; moleskin; plush; figured velvet ribbons, scarfs, &c.

39. Stief & Harrass, *Potsdam, near Berlin.*—Designers and Manufacturers.
Silk cravats; embroidered silk vestings; woven picture of grotto of Neptune, &c.

40. Landwehr, Heinrich, *Berlin, Prussia.*—Manufacturer.
Silk neckcloths and vestings.

41. Oehme, C. W., *Berlin, Prussia.*—Manufacturer.
Fine silk plushes; umbrella silks, &c.

42. Koch, Brothers, *Lansigk, Saxony.*—Manufacturers.
Velvets and plush; printed waistcoat plush.

43. Kuppers & Kindermann, *Crefeld, Prussia.*—Manufacturers.
Plain, figured, and watered satins.

44. Levin, Heinrich, & Sons, *Berlin, Prussia.*—Manufacturers.
Silks, vestings, plush, and fancy goods.

45. Bachoven & Vollschwitz, *Zerbst, North Germany.*—Manufacturers.
Samples of black silk plushes.

46. Knorr, Fred., *Zweybrücken, Bavaria.*—Manufacturer.
Silk plush, for hats.

47. Brockino & Ebelino, *Viersen.*—Manufacturers.
Superfine black satins.

48. Von Bauck & Sons, *Prussia.*—Manufacturers.
Fine black and colored velvets and velvet ribbons, of fancy and figured silk.

49. Meyer, J. A., & Co., *Berlin, Prussia.*—Manufacturers.
A variety of silks, satins, and velvet plushes.

50. Colsman, Brothers, *Langenberg, Prussia.*—Manufacturers.
Silks and silk shawls.

51. Lehmann, E. S., *Berlin.*
Printed Velvets.

52. Hiebner, J. Jun., *Culmbach, Bavaria.*
Specimens of velvets.

THE AUSTRIAN EMPIRE.

53. Ratti & Crivelli, *Milan, Lombardy.*—Manufacturers.
Silk stuffs and damask silk dresses.

54. Carlo, Ghiglieri, & Co., *Milan, Lombardy.*—Manufacturers.
Silk stuffs, dresses, &c.

55. Negretti, Perego, *Como, Lombardy.*—Manufacturer.
Plain and colored silk stuffs.

56. Bossi, Guiseppe, *Vienna.*—Manufacturer.
Printed foulard silks.

THE ITALIAN STATES.

57. Genicoud, Brothers, *Turin, Sardinia.*
Samples of raw silks and organzine, from the Protestant valleys of Piedmont.

58. Bravo, Michael, *Pinerolo, near Turin, Sardinia.*—Proprietor.
Samples of white and yellow raw silk; white and yellow organzine.

59. Guillot, J. & Co., *Turin and Genoa, Sardinia.*—Manufacturers.
Superfine velvets—black, pensée, green, ruby, and other colors; tapestry velvets; velvet lace.

60. Defferari, Brothers, *Genoa, Sardinia.*—Manufacturers.
Assortment of velvets, of various colors.

61. Chichizola, G., *Turin, Sardinia.*—Manufacturer.
Assortment of velvets.

62. Cattaneo & Pettiti, *Turin, Sardinia.*—Manufacturers.
Variety of rich silks, of all descriptions and colors.

63. Tasca, G. G., *Turin, Sardinia.*—Manufacturer.
Rich stuffs of silk and velvet.

64. Valeriani, E., *Florence.*—Manufacturer.
Samples of silk cravats.

65. Sinigaglia, Brothers, *Busca, Sardinia.*—Manufacturers.
Specimens of organzine, of three kinds, for different sorts of fabrics.

66. Pescia, F., *Genoa, Sardinia.*—Manufacturer.
Velvets and damasks.

SWITZERLAND.

67. Vonder-Muehll, Brothers, *Bâsle, Canton Bâsle.*—Manufacturers.
Twelve pieces of silk.

68. Baumann & Streuli, *Horgen, Canton Zurich.*—Manufacturers.
Ten pieces of silk.

69. Staubli, Jules, *Horgen, Canton Zurich.*—Manufacturer.
Specimens of superfine Gros du Rhin silk.

70. Zuppinger, H. de G., & Co., *Eichthal, Canton Zurich.*—Manufacturers.
Specimens of sewing and embroidering silk.

71. Wegner, J. R., *Bâsle, Canton Bâsle.*—Dyer.
Specimens of richly-dyed silks.

THE NETHERLANDS.

72. Taavaglio, J. A., & Son, *Haarlem, Netherlands.*—Manufacturers.
East India silk stuffs, and sewing silks.

SECTION III. CLASS XIV.

MANUFACTURES OF FLAX AND HEMP.

1. Taylor, & Co., *New York City.*—Manufacturers and Proprietors.
Specimens of improved sail-cloth.

2. Thursay, John, & Son, *New York City.*—Manufacturers.
Specimens of white or untarred rope, manufactured from all varieties of hemp, Manilla and Sisal; tarred rope from domestic and foreign hemps; cords and lines of various kinds.

3. West Stafford Linen Co., *Connecticut.*
Specimens of shoe-thread.

4. Demarest, Joralemon & Co., *New York City.*
Bidport, seine and gilling twine, manufactured from Belgium flax.

5. J. N. Carpenter, *Virginia.*
Fire-proof cordage.

6. Dolphin Mills, *Patterson, New Jersey.*
Hemp carpeting.

7. Frenche, James, *New York City.*—Manufacturer.
Shoe-threads, all sizes and colors; saddlers' cord, all sizes and colors; ball thread, for machine sewing; flax seine twines; flax broom stitching twines; flax ball twines; flax druggists' variegated twine; flax brush stitching twine; flax sail and seaming twine; flax sewing twine, for canvass and gunnies; flax seaming cord; flax wool twine; flax carpet warp; flax gilling twine; flax yarns, used in the manufacture of seines, fly nets, carpets, checks, shoe-threads, twines, and lines.

8. The American Linen Thread Co., *Mechanicville, Saratoga county, N. Y.*
Patent linen thread; linen thread, for sailors' use; tow yarns, in a variety of colors; whip-makers' and book-binders' thread.

[A new and highly important branch of American industry is represented by this establishment. The origin of the manufacture is very recent. In 1847, Gen. James Tallmadge, President of the American Institute, offered a gold medal for the best piece of linen, of not less than thirty yards, wove by power-loom. There was no claimant until 1849, when it was taken by Henry Stevens, of Webster, Mass. The first linen thread for sewing, made by machinery, in the United States, was manufactured in Lansingburgh, New York, in 1848. The enterprise failed for want of capital and patronage. In 1851, it was commenced at the Cohoes, with new machinery from England, made to order, and based upon a capital of $30,000. In this place, the vast importance of its fabric became more fully developed, and having attracted the attention of capitalists, it was removed to Mechanicville, and supported on a basis of $70,000. It now gives employment to upwards of eighty hands, throwing off daily an average of three hundred pounds of thread.]

GREAT BRITAIN AND IRELAND.

9. Barbour, Wm., & Sons, *Hilden Flax Mills, Lisburn, Ireland.*—Manufacturers.
White and colored linen threads; shoe-threads.

10. Murland, Henry.
Fine bleached linen; brown holland.

11. Fenton, Son & Co., *Belfast, Ireland.*—Manufacturers.
Irish linen fabrics; damask table cloths; napkins; heavy linens; linen cambric handkerchiefs; fine grass bleached and other linen fabrics.

12. Corson, David, & Son, *Arbroath, Scotland.*—Manufacturers.
Specimens of superior flax sail-cloth.

13. Scales & Heabert, *Newark-upon-Trent, and 9 Gresham street, London.*—Manufacturers.
Linen goods; sheeting, huckaback, crash, diaper, and other linens.

14. Normand, James, *Dysart, near Kircaldy, Scotland.*—Manufacturer.
Table linen, sheetings, &c.

15. Capper, Son & Co., 99 *Gracechurch street, London.*—Inventors and Manufacturers.
Linen damask toilet cover, containing the arms of the Queen of England.

16. Adamson, John, *Dundee, Scotland.*—Manufacturer.
Russins, creas, sheetings, croquillas, drillings, brown osnaburgs, paddings, and other linen fabrics.

17. Fletcher, Alex., & Co., *Glasgow, Scotland.*—Manufacturers.
Linen cambric handkerchiefs; linen thread; Flemish flax dressed; Scotch flax.

18. Dunbar, Dicksons, & Co., *Gilford, Ireland.*—Manufacturres.
Family and fronting linens, and linen shirtings.

19. D. Dewar, Son & Sons, *King's Arms Buildings, London.*
Damask linen table-cloths.

20. Gihon, William, & Sons, *Ballymena, Ireland.*—Manufacturers.
Fine linen fabrics.

21. Richardson, J. N., Sons & Owden, *Belfast, Ireland.*—Manufacturers.
Irish linens; single and double damask table-cloths, napkins, handkerchiefs, &c.

22. Ferguson, John S., & Co., *Belfast, Ireland.*—Manufacturers.
Irish linen fabrics.

23. Holdsworth, W. B., & Co., *Leeds, England.*—Manufacturers.
Specimens of linen thread; shoe and netting threads; unfinished threads and flax.

24. Samson, Hugh, & Co., *Hill Banks, Dundee, Scotland.*—Manufacturers.
Linen nettings.

25. Edwards, A. & D., & Co., *Dundee, Scotland.*—Manufacturers.
Fine linens; shirtings; sail cloth; all qualities of yarn.

26. Ullathornes & Longstaffs, 12 *Gate street, London, and at Durham, England.*—Manufacturers.
Shoemakers' and saddlers' threads.

27. Gavin, Peter, & Son, *Leith Ropery, Leith, Scotland.*—Manufacturers.
Sail-cloth.

28. Dunbar, McMaster & Co., *Gilford, Ireland.*—Manufacturers.
Linen sewing threads for tailors' use, netting purposes, and lace manufacture; linen yarn for manufacturing purposes.

29. Thompson, Malcolm C., *Glasgow, Scotland.*—Manufacturer.
Thread and twine for fishing nets.

30. Bennett & Adams, *Ballydevitt, Coleraine, Ireland.*—Manufacturers.
Specimens of Irish linen shirting.

BRITISH COLONIES—CANADA.

31. Bouchard, Madame, *St. Valière, Canada East.*—Manufacturer.
Samples of bleached linen thread and bleached linen.

32. Paquet, M., *Canada East.*—Manufacturer.
Samples of unbleached linen thread.

33. Paradis, Frans., *Canada East.*—Manufacturer.
A piece of unbleached linen.

34. Morin, Jaques, *St. Henri, Canada East.*—Manufacturer.
A piece of gray linen.

35. Tetu, Joseph, *Berthier, Canada East.*—Manufacturer.
Samples of bleached and unbleached linen.

36. Henderson, R., *Beauport, Canada East.*—Manufacturer.
Samples of deep sea lead-line and other cordage.

FRANCE.

37. Joyeux, Emile.
Specimens of spun flax.

38. Lebel, L., *Soissons, Aisne.*—Inventor and Manufacturer.
Specimens of flat rope for use in coal mines, and in stone quarries.

39. Grassot & Co., *Lyons, Rhone.*—Manufacturers.
Specimens of white damask thread table cloths, napkins, and doyleys.

40. Lelievre, Delame, & Son, *Valenciennes, and* 10 *Rue de Sentier, Paris.*—Manufacturers.
Linen fabrics; cambric and lawn.

41. Boniface, N., & Son, *Cambray, Nord.*—Manufacturers.
Linen fabrics; cambrics and lawns.

42. Bertrand, Brother, & Villian, 32 *Rue des Jeuneur, Paris.*
Various specimens of cambrics and lawns.

43. Louis, Blais, Jr., Letellier & Co., *Havre.*—Manufacturers.
Various specimens of cordage, for ships, shrouds, footropes, rigging, &c., made upon a new system.

44. Holland & Dubois, *Valenciennes.*—Manufacturers.
Specimens of linen cambrics, clear lawns, and fine yarns.

45. Merlie, Lefevre & Co., *Ingouville, Seine Inférieure.*—Manufacturers.
Specimens of hemp rope.

46. Scrive, Brothers, *Lille, Nord.*—Manufacturers.
Specimens of steam-dressed flax.

THE GERMAN STATES.

47. Trendel, J. J., Jun., *Culmbach, Bavaria.*—Manufacturer.
Linen, damask, half satin, and linen fabrics.

48. Meyer, C. H. F., *Schöppenstedt, Brunswick.*—Manufacturer.
Specimens of colored linens.

49. Beyers, Widow, & Co., *Zittau, Saxony.*—Manufacturers.
Fancy and plain linen drills, linen table cloths, napkins, &c.

50. Burbach, Brothers, *Gotha, Saxe Gotha.*—Manufacturers.
Hempen fire-engine hose, woven without seam; hemp bandages, and canvas fire-buckets.

51. Fabian, C. B., *Breslau, Prussia.*—Manufacturer.
Sail-cloth of unusual breadth, table cloths, and napkins.

52. Heinig, J. G., & Sons, *Altenberg, Prussia.*
Samples of twine and string.

53. Heller, G. H., *Göttingen, Hanover.*—Manufacturer.
Linen damask sheetings, table-cloths, &c.

THE AUSTRIAN EMPIRE.

54. Woedl, Georgias & Co., *Vienna.*—Manufacturers.
Linen and damask table cloths and napkins; linen handkerchiefs; bleached and unbleached linen drillings, &c.

55. Jenny & Schindler, *Hard, Voralburg.*—Manufacturers.
Printed linens.

SWITZERLAND.

56. Heiniger, Jacob, *Bourgdorf, Canton Berne.*—Manufacturer.
Cotton and wool canvas for cross stitch embroideries; cotton Java canvas; specimens of crochet threads.

BELGIUM.

57. Laere, Moerman Van, *Ghent.*—Manufacturer.
Specimens of canvas.

58. Bongarts, P., *Antwerp.*—Manufacturer.
Specimens of hemp bagging and carpets.

59. Jelie, J. B., *Alost*—Manufacturer.
Samples of undressed thread.

THE NETHERLANDS.

60. Van Catz, J. P., *Gonda.*—Manufacturer.
Bridles and halters of fine hemp; game bags; twines and cords of various qualities; specimens of dressed hemp.

61. Van Beeftinon & Co., *Katwyk.*—Inventor and Manufacturer.
Concentric, or equal-drawing rope.

62. Van den Hoogen, J., *Dordrecht, Netherlands.*—Manufacturer.
Coil of tarred rope.

63. Theunisen, J., *Meppel, Netherlands.*—Manufacturer.
Linen, bedtick, and canvas.

64. Van der Heyden, D., & Son, *Krommenie, Netherlands.*—Manufacturers.
Sail-cloth and canvas.

65. Ten Doesschate, A. J., *Goor.*—Manufacturer.
Linens, table cloths, and napkins.

SECTION III. CLASS XVI.

LEATHER SKINS, FUR, AND HAIR, AND THEIR MANUFACTURES.

The manufacture of skins into useful and ornamental articles is one of great antiquity and importance. Skins to be worn as an ornamental dress are prepared by the fur-dresser. They are made soft and pliable by being trampled and rubbed with grease, and the fur is cleaned and made glossy by repeated rubbings with mahogany sawdust. The furs most esteemed for their beauty and fineness come from northern and Arctic regions. The fur reaches its greatest perfection at the approach of winter, and before the animal has attained great age. The rarer and costlier furs are often imitated by the furrier by dyeing inferior skins, and those of a different species. Good examples of the genuine furs and their imitations are exhibited.

The hides and skins best adapted for leather are chiefly supplied from the animals of temperate and tropical regions. Leather possesses properties entirely different from those of the raw material, but which vary with the kind of skin and the processes to which it is subjected. Chemically considered, all leather is a compound of the gelatine of the skins with the vegetable product, tannin; and the process of combining them constitutes the art of tanning. As an empirical art, tanning has been practised from the earliest times. The ancient methods, however, comprehended little more than cleaning and drying the skins; they did not prevent the re-absorption of water, and the consequent tendency of the skins to injury and decay. At a later period it was discovered that this tendency might be resisted by immersing the skins in infusions of bark, or a solution of alum. This manufacture has received less assistance from chemistry than might have been anticipated. Notwithstanding numerous investigations, and the number of patents granted for new processes, no decided improvement has been made, and the results of the new processes are no better than those of the old. It is far otherwise, however, in regard to the mechanical operations of tanning; all these are greatly aided, or entirely carried on, by the aid of water-power or the steam engine. Several ingenious machines have been invented to perform special operations. The most important is the splitting machine, by which hides and skins are completely separated, the upper surface from the under, leaving each part of the same superficial dimensions as the original hide. The hydraulic press is used to express the grease from skins to be dyed, and more brilliant colors are in this way produced.

The principal steps in the manufacture of leather are, first, washing and soaking, by which the skins are cleaned, softened, and prepared for the second operation—the removal of the hair, effected by the use of lime, or similar substances, to destroy the roots of the hair; third, the unhaired skins are tanned by immersion in an infusion of tannin, aided by the extractive matter always present in such an infusion; fourth, drying, rolling, and other operations intended to perfect the quality and appearance of the leather, and fit it for particular uses, are the last of the series.

In the United States the tanning of leather did not acquire importance until the first of this century; it is now, with its dependent manufactures, one of the most prominent branches of national industry and wealth: according to the last census returns, the number of tanneries in the United States is 6,263; the capital employed, $18,900,557; number of workmen, 21,011; value of raw material, $19,613,237; value of product, $32,861,796. About 6,000,000 skins of sheep, goats, &c., are dressed annually, not included in the foregoing estimate.

The specimens of enamelled, sole, and fancy leathers; of morocces, calf skins, buckskins, and machine-belting, are very creditable to American skill. The harnesses combine lightness with strength, beauty, and convenience of form. The collection of articles in hair-work is quite extensive, and displays great skill and taste.

England sends fine calf skins, morocces, dyed sheep skins, and chamois leather; saddles and whips. From Canada there is sent fine sole-leather and calf skins; moose-hide, dressed by the Indians. From the Hudson's Bay Company, and from Newfoundland, there is a fine and extensive assortment of furs. Germany sends varnished and japanned leather, morocco and chamois, vellum and parchment, fancy articles in leather, and works in human hair. From Belgium is sent fine varnished leather. France maintains her supremacy in the preparation of calf skins, from using peculiar materials in tanning, as will be hereafter explained. The varnished leather, morocces, patent dressed and glove leather, are fine. Switzerland sends excellent calf skins, and polished and japanned leathers. From Holland is sent hair cloth, and dressed grebe skins. Austria exhibits fine calf, japanned and varnished leathers, embossed sheep and goat skins. The morocco and calf from Italy are of excellent quality.

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1. Chadwick, John, & Co., *Newark, New Jersey.*—Manufacturers.

Patent japanned and enamelled leathers of various colors; fancy colored calf skins for harnesses, and skivers for hat linings. An ox-hide manufactured into enamelled leather, containing 100 square feet.

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2. Smith, James R., *New York City.*—Manufacturer.

Specimens of variously colored and striped morocces and skivers.

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3. Cook & Mann, *New York City.*—Proprietors.

Various descriptions of colored leather, morocco, skivers, roan, calf, sheep, and Russia, for book-binders and pocket-book makers.

[The most important of the light fancy leathers is *Morocco leather;* its manufacture in the United States is rapidly increasing, and in the city of Philadelphia alone nearly two million skins are manufactured annually; they are imported in a dry state from Mexico, the East Indies, Curaçoa, and Buenos Ayres. True "morocco" is made from goat-skins, but the imitation morocco is made from sheep-skins. After the skins have been cleansed, and the hair separated by the usual process of soaking in lime water, and the greater part of the lime has been removed from the pores by digestion in some impure alkaline solution, they are immersed in the tanning liquid. Each skin is then sewn up in the form of a bag, the grain side outwards, and nearly filled with a strong decoction of sumach; the rest of the bag is distended with air to enable it to float, and it is then thrown into a weak infusion of sumach, in which it is occasionally moved about for three or four hours. When the tanning is complete, the skins are opened, washed, rubbed as smooth as possible, and then hung up to dry; when dry,

they undergo the process of dyeing, just as in dyeing wool, cotton, or silk; sometimes the dyeing takes place before the tanning. The mordant, if any is necessary, is first applied, being generally a preparation of tin or alum; and then the coloring material, as decoction of cochineal for crimson and scarlet, decoction of logwood for puce, solution of sulphate of indigo or the common blue-vat for blue, cochineal red and afterwards light indigo blue for violet, solution of the impure acetate of iron (dyers' iron-liquor) for black,—these are applied to the grain side only. As morocco is generally dyed only on one side, two skins are commonly put in close contact, the outer sides only being dyed. After being rinsed, they are subjected to a kind of currying process which restores their original pliability; this is either by being passed, while moist, in different directions between two nearly touching revolving cylinders, or by being rubbed by instruments of different hardness, one of which is a wooden ball or roller with five parallel grooves on its surface, which give the peculiar grain distinctive of morocco. The same operations are followed with sheep-skins.

Skivers, for hat-linings, pocket-books, &c., are prepared from sheep-skins split by machine when in the state of pelt, and tanned by immersion in infusion of sumach. *Roan*, much used for book-binding, is generally prepared from sheep-skin by means of sumach, in the manner of morocco; but it has not the grained appearance of the latter caused by the grooved roller.

Enamelled leather for ladies' shoes, belts, &c., is also prepared by means of sumach from calf or seal skin; the gloss is given by a peculiar varnish.

Sumach, also extensively used in dyeing and calico printing, consists of the powder of the leaves of the *Rhus cotinus* and *R. coriaria* of the South of Europe; the latter is most used in tanning, the former in dyeing; almost all the leather made in Turkey is said to be tanned by the R. coriaria. European sumach contains, according to Sir H. Davy, 16 per cent. of tannin; Virginia and Carolina sumach are said to contain only 10 and 5 per cent. The tannin of sumach seems to be identical with that of galls; gallic acid exists in it ready formed to a considerable extent. Mixed with water it is more apt to enter into decomposition from fermentation than any other tanning material.

Russia leather is in great demand for book-binding on account of its resisting decay in damp situations, and being free from the attacks of insects and fungi. It is prepared by tanning the skins of calves, sheep, and goats with a warm decoction of willow bark; the red dye is communicated by a decoction of red sanders wood, and afterwards applying by a kind of currying process an empyreumatic oil obtained by distillation from the bark of the birch tree, which gives it its agreeable odor. The hair is said to be loosened by a weak wood-ash lye, of which the active principle is carbonate of potash. The process of manipulation, as carried on in Russia, produces an inferior article when practised in other countries; the difference is generally attributed to the water and the bark used. Willow bark is not much used in tanning, as it produces only one-third of the effect of an equal weight of oak bark. Besides Russia leather, Danish leather, of an agreeable odor, and much used for gloves, is generally prepared from kid and lamb skin by willow bark.]

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4. Kennedy, D., *Reading, Pennsylvania.*—Patentee.

Samples of chemically tanned leather without the use of bark, or with only one-fourth the usual quantity.

[The advantages he claims for his process are: cheapness, saving of space and time, and the superiority of the article. To tan a dozen common sized calf skins costs from seventy-five cents to a dollar, and in proportion for larger hides. It requires much less room to carry on the business than the old method; and the process is completed in one-fourth the time. Sheep, goat, deer, calf, and similar skins, require from three to ten days; kip, upper, harness, skirting and heavy sole leather require from twenty to eighty days. The process may be learned by any tanner in a short time. It is said to give greater strength, durability, softness and pliability, and weight; it fills up better, with a finer texture, finishes up better, and is more impervious to water. Sheep and goat skins become as strong as calf, and will retain their shape in boots and shoes equal to it. The apparatus and stages of the process are similar to those of the old method.

The old process of tanning was extremely slow, requiring often two years for its completion. This has given rise to many attempts to shorten the process, but it is generally admitted that the leather thus produced is in many respects inferior to that resulting from the old process, which is still preferred for the finer qualities. The deterioration, however, has not been exactly in proportion to the reduction of time, so that there is room to hope that a superior article may yet be more quickly prepared. The conversion of skins into leather is generally believed to be a change of the hide into a gelatinous material, and its combination with tannin; and a considerable time is requisite for this change to take place in a uniform and perfect manner. In the oldest process the hides were merely placed in contact with successive layers of slightly moist fresh-ground bark, renewed every two or three months, till the process was nearly complete, when the pit was filled with a strong infusion of bark. From the small amount of liquid present in the hides and the tan, the process must have been extremely slow; by the free use of water, and an infusion of bark, the time is considerably shortened. In almost every extensive tannery the hides are subjected to previously prepared infusions of tannin, commencing weak and gradually becoming stronger; many tanners prepare these infusions with lukewarm or hot water; there are two kinds according to the strength, the "handlers," the weakest, and the "layers" or "bloomers," the strongest, the latter being generally intended to produce the deposit called the "bloom." Various methods are used by different tanners for preparing the materials, and for placing the hides in the pits. Several processes have been devised for accelerating the impregnation with tannin, by forcing the liquid through the pores of the skin by hydrostatic pressure, with or without previous exhaustion of the air in the containing vessel; but the leather thus made has been of inferior quality. By removing by compression between rollers the impoverished liquor absorbed in one pit before the hide is transferred to a stronger infusion, the tanning process takes place with greater rapidity: by this method a strong hide may be tanned in from one to two months, and kips and skins in three or four weeks; and the thickest sole leather may be sent to market in four months after it has been received. The best method of accelerating the tanning process by mechanical means is that practised in some of the English tanneries for upper leather: in this process the skins are introduced into a horizontal wooden cylinder, ten feet long, with some of the fresh tanning material and a hot tan-liquor; the cylinder, tightly closed, is rotated on its axis about eight times in a minute; the inside of the cylinder has several short projecting ridges to increase the agitation and prevent the skins from being rolled up into balls; when the liquor is spent, fresh material and hot liquor are supplied. This process combines three advantages important in tanning not united in any other process, viz.: constant agitation, a warm tan-liquor, and absence of atmospheric air; thick kips are thus perfectly tanned in fourteen days, and as no air gains admission, the formation of dark coloring matter is almost entirely prevented. In order to shorten the process, and to increase the capacity of the hide for receiving tannin, it has long been the custom to swell and open the pores by the free use of lime, or acid liquors; the fibres of the hide are by this means rent asunder in various directions, impairing the organic structure and diminishing its strength and firmness. In the old slow process the arrangement of the fibres is very nearly the same in the leather as in the original skin; while in the modern quicker processes the leather is loose and weak from the distortion of the fibres. It is generally admitted that the increase in weight and quality of the leather, resulting from leaving the hide in the vats two years instead of one, pays a fair interest on the capital invested.

Mr. A. H. Buzzell, of Bridgeton, Maine, has patented a process, in which, after raising the hide by sulphuric acid, and charging it with tannin, he suspends sacks containing wood ashes in the pits in order to destroy the compound formed by the tannin and sulphuric acid, which prevents the gelatine of the hide from uniting with the tannin.

As liming retards the process by preventing the rapid union of tannin with gelatine, Turnbull treats the hides after liming with a concentrated solution of sugar, thus preventing the access of air and the formation of gallic acid. In this manner, the same amount of leather is obtained in two weeks from 100 lbs. of oak-bark, as is usually obtained in eighteen months from 800 lbs. of bark.

The process of preparing leather by alum and salt, technically called "tawing," will be described when speaking of glove leathers. A combination of this process with the tanning process by means of catechu has been proposed in the London Journal, vol. 36, page 310 (1850); in the same journal the use of sulphuret of calcium is suggested instead of lime for unhairing. By a patented process similar to tawing, Mr. J. Bordier has lately prepared leather by using peroxide of iron instead of alumina; by this, thick sole-leather may be made of great durability in two or three weeks. The solution of the subsulphate of the peroxide he has found best; six to eight days are sufficient for hides, three or four days for skins. The effect of this is to render the animal fibre imputrescible, but the leather is as permeable to water as that tanned by the usual methods; the proper impermeability, strength, and tenacity are given to it by currying.]

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5. Smith, Edmund A., *New York City.*—Manufacturer.

Various kinds of fancy colored morocco leather.

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6. Clewer, James, *Tannersville, Pennsylvania.*—Manufacturer.

Samples of oak-tanned leather for belting or sole leather.

[The astringent principle of the oak-bark, called "tannin," exists, with trifling differences of no practical importance in this connection, in several different vegetables. Its most characteristic properties are its astringent taste, and its power of being precipitated from its watery solution of a bluish black or dark green color by a solution of the peroxide of iron, and of a dirty white or brown color by a solution of gelatine; the former precipitate being the basis of writing ink, and the latter, *tanno-gelatine*, being analogous to, but not identical with leather. Tannin is readily convertible into *gallic acid*, which also exists ready formed in many vegetables; gallic acid is of very little service, if of any, in tanning, as it does not combine with gelatine and gelatinous tissue, this should suggest to the tanner the necessity of guarding against the circumstances which favor the conversion of tannin into gallic acid.

Oak-bark has always been more used in tanning than any other substance; its tannin is colored in the inner layers of the bark; according to common estimation 3½ to 4 lbs. of bark are required for one pound of leather; the leather made from it is the best, though the process is the longest.

Next to oak, *hemlock bark* is most used in this country; it contains a large quantity of tannin. In the tanneries of Prattsville, New York, it is extensively used; sides of sole leather are there tanned from Buenos Ayres, Laguayra, Rio Grande, English salted, and native slaughter hides, in from 4 to 6 months, with a gain in weight of from 57 to 73 per cent. The bark is generally peeled in May and June, and weighs, when dry, about 2200 lbs. per cord; a cord of the bark will tan about 200 lbs. of leather.

Dividivi is the pod of a leguminous plant (*Cæsalpinia coriaria*), growing in the northern parts of South America; the tannin resides in the rind of the pod, immediately under the epidermis. Besides tannin it contains a mucilaginous substance which prevents its use in dyeing and calico printing. Like sumach it readily enters into a state

of fermentation when mixed with water. Leather made by it is very porous, and almost always of a brown color; the buff colored deposit, called "bloom," is freely produced by it. Kampfmeyer, from his experiments, states that sole leather made by this is, in dry weather, about as good as oak-tanned; in wet weather it is inferior. It is considerably used in England, alone or with oak-bark.

Valonia consists of the acorn cups of the prickly-cupped oak, *Quercus ægilops*, growing abundantly in the Morea and adjacent countries. About 2 lbs. on an average are necessary to make one pound of leather, which is said to be harder and less permeable to water than that made with oak-bark, and so heavy as to make this the cheapest of all tanning materials with the exception of catechu. Its infusion readily gives the "bloom."

Catechu, cutch, terra japonica, are names given to the inspissated aqueous extracts from the bark, wood, and leaves of the *Acacia catechu* and *Uncaria gambir* of the East Indies; it contains about half its weight of tannin. Skins may be tanned with great rapidity by catechu, but the leather is permeable to water, light, and spongy, and its color is dark, which is an objection, as purchasers consider a coating of "bloom" an indication of the goodness of the leather. A given weight of catechu will tan four times as many skins as the same weight of oak-bark; a pound of catechu will produce a pound of leather, so that where oak-bark is scarce, it is the cheapest of all tanning materials.

Elsner states that in Wallachia, Moldavia, and Transylvania, the root of the *tormentil* or septfoil is extensively used in tanning; chemical analysis shows the presence in it of from 17 to 34 per cent. of tannin.

The best practical way of ascertaining the amount of tannin in a substance is that proposed by Pelouze, which is to hang a strip of fresh hide ready for the tan vat in a tannic solution, and to keep it there till it ceases to gain in weight; the increase is tannic acid, the gallic acid being left in the solution.]

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7. Classon, Joseph, *New York City.*—Manufacturer.
Morocco and colored bridle leather.

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8. Sears, W. A., *New York City.*—Manufacturer.
Oak-tanned sole leather; American calf-skins.

[The tanner divides his skins into three classes, technically known as hides, kips, and skins. *Hides* are the skins of large and full-grown animals, as the ox, the horse, the buffalo, &c.; *kips* are the skins of the same animals when young, though many kips belong to full-grown cattle of small breed; *skins* belong to small animals, as sheep, goats, seals, dogs, &c.,—the first being used for thick and strong sole leather, the last two for upper, glove, and fancy leathers. To produce forty pounds of leather are required, on an average, thirty pounds of dry hide, sixty pounds of salted hide, and sixty-six of market hide.

All hides require certain operations preparatory to tanning, such as removing superfluous portions of flesh and fat, the hair, epidermis, and dirt. After rubbing in water, the first object is the removal of the hair: the oldest way of doing this, and the one most extensively employed in Europe and America, is an application of a solution of lime; hides require a liming of from one to three weeks; sheep skins from two to five days; the hair is then removed by a two-handled iron scraper, the hides being laid upon an arched bench, called a "beam." On the Continent incipient putrefaction is much resorted to for the removal of the hair; sulphuric acid, sour milk, fermented barley and rye-water, and other vegetable acidulous matters, are often used instead of lime. In America is used the process of softening the epidermis and the roots of the hair by the use of cold water, either as a slight spray or as a mist or vapor, at about the temperature of 50° F.; in this free circulation of damp air, hides require from 6 to 12 days for unhairing; the increase by tanning in this method will amount to from fifty to eighty per cent., the increase of absorbed matters doubtless depending on the slight decomposition, if any, of the gelatinous tissue. Kips and skins are treated much in the same way as hides, particular care being necessary to remove all the lime by the process called "graining;" this consists in immersion in alkaline solution in which sal ammoniac is the most active constituent; carbonate of ammonia, as used in the patent process of Mr. R. Warrington, 1841, does not dissolve out the lime, but destroys its causticity by converting it into chalk. Sheep skins, before being limed, should be freed from as much of their oil as possible; what is left will form with the alkali an insoluble soap which does not retard the tanning; the "grainer" for sheep skins is generally bran-water. The skin of the hog is difficult to tan, from the great quantity of fat; saddles are usually made of it. Human skin requires a considerable time for thorough tanning; horse skin is liable to crack unless perfectly tanned. Of late years great quantities of cheap and thin leather have been made from hides split in halves by machinery; the grain or hair side, which makes the best leather, being used for shoes, and the flesh half for inferior purposes. Many sheep skins are thus split, the grain side being used for gloves, the flesh side for wash leather. Very ingenious machines have been invented for splitting leather.]

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9. Locker, H. C., *Lancaster, Pennsylvania.*—Manufacturer.
Specimens of black morocco leather.

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10. Jacobus & Utter, *Newark, New Jersey.*—Manufacturers.
Bridles and skating leather.

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11. Crawford, Henry M., *Philadelphia, Pennsylvania.*—Manufacturer. (Cohocksink Tannery).
Finished and unfinished calf skins.

["Bloom" is the name given to the yellowish-fawn colored deposit from the tanning liquors on the surface of the leather, and penetrating to a slight depth. Though this is removed by the currier and the shoemaker, and is a useless weight, it is quite essential to the sale of the leather; it is, however, an evidence of the goodness of the leather to a certain extent, as it is not easily obtained by the modern quick processes. This bloom in common oak-bark tanning is closely analogous to, if not identical with, *ellagic acid*, a product of the decomposition of tannin. The modern processes afford more coloring matter than the old, and the new tanning materials more than oak-bark; though it is not by any means established, that dark-colored leather is always of inferior quality.

Sole leather is fit for the shoemaker in the state in which it leaves the tanner's hands; but that intended for upper leather, for coach makers, saddlers, &c., has to go to the currier, who gives it the necessary impermeability to water, softness, smoothness, color, lustre, &c. After moistening with water, and shaving off all superfluous thickness, the currier wets the leather and rubs it on the grain side with pumice, which removes the superficial bloom; he then rubs it on each side with a wooden instrument, rounded on the lower surface, and with a number of transverse parallel grooves, called the "pommel," which gives it flexibility; after another scraping, it is "dubbed" with oil, tallow, lamp black and oil, &c., according to the purpose for which it is required; it is finally polished with hard wooden rubbers. Shoe leather is blackened on the flesh side, but for some purposes it is blackened on the grain side; in which case it is moistened with a solution of copperas in water, which forms on exposure to the air the black tannate of the peroxide of iron.]

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12. Franklin, H., *New York City.*—Manufacturer.
Specimens of leather.

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13. Adler, George S., *Philadelphia, Penn.*—Manufacturer.
Specimens of fine morocco kid; plain and enamelled patent japanned goat-skin leather.

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14. Baodt, H., *Philadelphia, Penn.*—Manufacturer.
American calf-skins, with French finish.

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15. Page, Edwards, *Lawrence, Mass.*—Manufacturer.
Machine belting of stretched leather; power-loom harnesses.

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16. Hoffman, Jacob, *East Waterford, Pennsylvania.*—Manufacturer.
Specimens of oak-tanned sole leather.

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17. Grosholt, L. and P. (Agents of Suer, Paris), *Philadelphia, Penn.*
Fine French calf skins.

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18. Ramsberg & Ebert, *Georgetown, D. C.*—Manufacturers.
Buckskins of various colors, for opera boots and shoes, gloves, daguerreotype polishers, pianо-forte leathers, saddle-seating, &c. Specimens of gloves and gauntlets of buckskin, plain and ornamented; illustrations of the different processes and stages of manufacture of the skin.

[Leather which is used for gloves, shoe-linings, and other purposes where great softness is required, is made by a process called "tawing;" the skins most commonly treated in this way are those of the kid and goat, sheep and lamb, and deer. After being soaked in water to soften them, scraped on the "beam," limed for about a fortnight, and soaked in a fermenting mixture of bran and water, the skins are soaked for a few minutes in a mixture of alum and salt dissolved in water, or in this solution with flour and yolk of eggs; they are then washed and dried. The aluminous compound, by combining with which the skins become leather, is considered by Berzelius to be a subchloride of aluminum. Flour and yolk of eggs are added only in the preparation of the finest kid leather; 100 skins require from 6 to 8 lbs. of alum and about as much salt, and one egg for each skin. Calf skins are sometimes "tawed," and in Spain they are so admirably dressed, that the average weight does not exceed 20 ounces. Buckskin gloves are made of the white tanned skins of the common deer, *Cervus Virginianus.*]

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19. McNeely, William T., *Philadelphia, Penn.*—Manufacturer.
Specimens of leather for piano-forte manufacturers.

[The process of manufacture gives to the leather a body, a high degree of elasticity, and a perfect freedom from oil; qualities which enable it to produce a clear and voluminous tone, which is not liable to become harsh and wiry, as is apt to be the case with leather from which the oil has not been thoroughly removed.]

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20. McFarland, Owen, *Newark, New Jersey.*—Manufacturer.
Russet covered mounting carriage harness; silver robed mounting, and fancy carriage harness; fancy single harness.

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21. Condict, Horton & Co., *Newark, New Jersey.*—Manufacturers.
Specimens of fine saddlery; bridles, spurs, &c.

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22. Stevens, Benjamin, *Bridgeport, Conn.*—Manufacturer.
Changeable saddle, adapted for either a civilian or a high military officer.

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23. Wright, Betts & Co., *New York City.*—Manufacturers.
Saddles of various styles, ornamented with fancy stitching.

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24. Ross, Theodore, *Nyack, Rockland County, New York.*—Proprietor & Manufacturer
Patent adjustable saddle.

25. Holt & Hanesford, *Boston, Mass.*—Manufacturers.
Set of double harness made for President Pierce.

26. Lacey & Phillips, *Philadelphia, Penn.*—Manufacturers.
Harnesses and saddles, highly ornamented and finely made.

27. Poater, William T., *New York City.*—Exhibitor.
Mexican saddle.

28. Latham, Henry B., *Smithtown, Long Island, New York.*—Patentee & Manufacturer.
Patent anti-friction, ventilating, and self-adjusting collars and hames.

29. Seidenstricker, J. B., & Son, *Baltimore, Maryland.*—Manufacturers.
Taylor's patent hame fastener.

30. Summers, Stephen F., *St. Louis, Missouri.*—Manufacturer.
Steel-spring leather trunk; highly ornamented. (The embroidery done by Mrs. Summers.)

31. Miller, Mrs., *Newark, New Jersey.*—Manufacturer.
Sheepskin inside soles for ladies' shoes, dressed with the wool; an entire skin prepared in the same way.

32. Lasak, F. W., & Son, *New York City.*—Manufacturers.
Specimens of manufactured furs and dressed skins.

33. Carter.—Manufacturer.
Racoon skins and furs.

[The dark skins of the Racoon, *Procyon lotor*, are very handsome and valuable; the common skins are used in the manufacture of hats. Great numbers are sent to England, whence they are sent to the great fair at Leipsic; they are used throughout Germany and in Russia, for linings for gentlemen's wear.]

34. Bennett, Frank, & Co., *New York City.*—Manufacturer.
Ladies' fine furs.

35. Bulpin, George, *New York.*—Manufacturer and Importer.
A variety of fancy furs.

36. Todd, Ira, *New York.*—Manufacturer and Proprietor.
Variety of furs.

37. Genin, John N., *New York.*—Importer.
Rich furs of various descriptions; royal ermine, sable, stone marten, mink, &c. (See note to No. 74.)

38. L. Dubain, *New York.*—Manufacturer.
Military and fancy bonnet feathers, of various styles and colors.

[The kinds of feathers most used for dress and military purposes are those of the Ostrich, Marabou Stork, American or three-toed Ostrich, Emeu, Herons, Birds of Paradise, Ibis, and domestic fowls.

Ostrich feathers, from Africa, are worn both in their native state, and variously colored. Marabou feathers are the under tail coverts of the *Ciconia argala*, and *C. Marabou;* the former, the adjutant crane, of tropical India, furnishes the best; the latter inhabits Africa and Asia; both are very large, being sometimes six feet high: they are very light, and are much worn for head-dresses; the white kinds are quite valuable. The feathers of the American Ostrich, *Rhea Americana*, are extensively worn on bonnets, and as military plumes. The feathers of the Emeu of New Holland, of the white egret heron, and of the osprey or fish hawk, are used in military costumes, and for ladies' ornaments. Birds of Paradise have in all ages been worn as the rarest ornaments. The tail feathers of the domestic cock, natural or dyed, are much used for military plumes; the feathers of the Ibis are much admired for their metallic lustre and changing colors. The manufacture of feathers into ornaments employs great numbers of females, especially in Europe.]

39. Medhurst & Heard, *New York.*—Manufacturers.
Transparent wig; white gossamer scalp; ladies' and gentlemen's ornamental hair work.

[The great and increasing prevalence of premature baldness among us cannot fail to strike the most superficial observer. One great reason is, without doubt, to be found in the present absurd covering of the male head; in addition to its want of beauty, the modern hat so firmly embraces the head as to impede the natural circulation in the scalp, and to entirely prevent the escape of the insensible perspiration; these causes cannot fail to injure the natural growth of hair, and to lay the foundation for premature grey hairs and baldness.]

40. Bourgard, Charles, *New York.*—Manufacturer.
Various specimens of wigs; drawings of a patent wig-making machine in the same case.

41. Phillip, John, *New York.*—Manufacturer.
A variety of wigs.

42. Clirehugh, V., *New York.*—Manufacturer.
Specimens of ventilated and gossamer hair work, wigs and toupées.

43. Phalon, Edward, *New York.*—Manufacturer.
Wigs and toupées.

44. Duprat, D., *New York.*—Manufacturer.
Wigs, toupées, and invisible textambes, made on a new system by the exhibitor.

45. Brown, Miss S. F., *Newark, New Jersey.*—Manufacturer.
Variety of hair work.

46. Cameron, W. R., *Brooklyn, New York.*—Manufacturer.
Improved natural skin wigs.

47. Gerker & Beehler, *Philadelphia, Penn.*—Manufacturers.
Specimens of curled hair, cow-hide whips, bristles.

[The hair of animals consists of slender flexible tubes, resembling the fibres of horn, and possessing the properties of coagulated albumen: fur is very fine hair, thickly set and commonly contorted. Hair is very durable and elastic, and thus forms the best stuffing for cushions and mattresses. Horse hair is dyed of various colors. After being steeped in soap-suds at 130° for 24 hours, it may be colored brown by leaving it for 12 hours in a decoction of logwood in limewater, at 120°. If the brown hair be dipped in water containing a little tin-salt, it assumes a violet-blue shade; for blue, the hair is first mordanted in a hot solution of 2 parts alum and 1 part argal, wrung out and passed through water containing a little sulphate of indigo, washed and dried; for red it is placed in water containing tin-salt, for half an hour, wrung out and left for 24 hours in a bath prepared by boiling redwood with alum, washed and dried with a gentle heat.

Bristles may be bleached by remaining two or three days in a saturated solution of sulphurous acid in water; most kinds may be bleached by merely moistening them and exposing them to the air, or by moistening them with very dilute sulphuric acid and exposing them to the sun.]

48. Wilkens, William, *Baltimore, Maryland, and New York City.*—Manufacturer.
Samples of curled hair, for stuffing sofa-cushions, &c.

GREAT BRITAIN AND IRELAND.

49. Deed, John G., *London.*—Manufacturer.
Morocco leathers of various colors, dyed sheep and lamb skins for rugs and mats.

50. Clark, Cyrus and James, *Glastonbury, Somersetshire.*—Manufacturers.
Dyed angola, sheep, and lamb skins, for rugs and mats; shoes, slippers, goloshes, gaiters, patent leather, boas, muffs, &c.

[When skins are "tawed" with the wool on, as for mats and rugs, they are doubled with their wool side inwards, so as to expose only the flesh side to the alum mixture. Calf skins and others with the hair attached, are also occasionally converted into leather. The Russian, Astracan, Hungarian, and Spanish lamb skins are remarkably fine. The grey and black Russian lambs are mostly used for coat and cloak linings, collars, caps, &c. The Astracan lamb is a rich, glossy, black skin, with short fur, having the appearance of watered silk. The Hungarian lamb is produced in that country in immense numbers;—of it is made the national coat; in summer the woolly part is worn outside, in winter inside; they are often highly decorated. The Spanish lamb furnishes the well-known short jacket of the country.]

51. Pelling, Thomas, & Co., *Glasgow, Scotland.*—Manufacturers.
Waxed calf skins, saddler's basils.

["Basils" are inferior sheep skins tanned by hemlock bark; "backs" are hides prepared by the usual Scotch method, which is to "raise" the hides by dilute sulphuric acid, after they have been unhaired by the usual liming process, and then to taw them by a mixture of the fresh tanning material and an infusion.]

52. Pelling, John, & Son, *Manchester, England.*—Manufacturers.
Curried calf skins.

53. Bayley & Shaw, *Lenton, near Nottingham, England.*—Manufacturers.
Chamois leather, variously colored morocco, glue, &c.

54. Bevington & Morris, *London.*—Manufacturers.
Chamois, morocco, and calf skin mats and rugs of sheep and lamb skins, dyed in various colors and ornamental figures.

[The leather manufacture of Great Britain is the third or fourth in point of importance, being surpassed only by the cotton, wool, and iron manufactures; and if the connected trades be added to it, as the currier, shoemaker, saddler, glover, it may, perhaps, rank equal to cotton.

The peculiarity in the preparation of chamois leather is the application of oil to the skins instead of tannin or alum. Formerly only the skin of the chamois-goat was thus prepared, but now the skins of many other animals are subjected to this process; the coarser kinds are known as wash-leather. After being prepared in the usual way, the skins are smeared and fulled with cod oil, or any cheap animal oil; two or three gallons of oil will be absorbed by 100 skins; the skins are then allowed to undergo a slight fermentation, and are finally immersed in a weak solution of potash, which re-

moves the superfluous oil, forming with it a soluble soap. A great deal of chamois leather is made from the least regular portion of split skins. Oil produces no chemical alteration of the fibre of the skin, and the indisposition to putrefy probably depends chiefly on the expulsion of fluids and putrescible matters, soluble in water, in the fulling stocks. Chamois leather may be resolved into glue by boiling water. A new kind of leather has been made by first slightly tanning the skins in the usual way, by infusion of willow bark, and then impregnating them with oil in the fulling mill.]

55. Maiden, Charles, *Lewisham, Kent, England.*—Inventor.
Riding saddle on an improved principle.

[The flaps and pannel are fixed and relieved by hand; it is convenient for travelling, or for shifting after a heavy saturation; the bearings are free, and the use of nails has been avoided. A favorite-seated saddle can be supplied with additional flaps and pannel.]

56. Blyth, Robert, *Piccadilly, London.*—Manufacturer.
Lady's saddle; hunting and race saddles; harness pad, &c.

57. Lennan, William, *Dublin, Ireland.*—Manufacturer.
Hunting saddles, very light.

58. Swaine & Adeney, *London.*—Manufacturers.
Riding and driving whips, plain and ornamental; walking canes.

59. Blyth, Son, & Cooper, *London.*—Manufacturers.
Feathers and hair.

[Feathers from common birds, and the soft fine down from aquatic birds of cold climates, are similar to hair in chemical composition. They are purified by exposing them to heat; the oil is extracted by immersion in lime water, and afterwards washing in pure water. From their elasticity, softness, and non-conducting powers, they are eminently useful to man.]

60. Hewlett, A., *London.*—Manufacturer.
Wax bust, with lady's head dress, wig, transparent scalp, showing shades of hair dye.

BRITISH POSSESSIONS—CANADA.

61. Tetu, C. H., *Rivière Ouelle, Canada East.*—Manufacturer.
Samples of porpoise leather, brown or velvet, light and strong black. [This obtained a prize-medal at the London Exhibition, 1851.]

[The leather made from the skin of the Porpoise, *Phocœna communis*, and *P. Americana*, is said to be the strongest known, and is used particularly for upper leather; it is said, however, not to stand water well. This animal is very common, and the manufacture of leather from its skin promises to be of considerable commercial importance.]

62. Local Exhibition Committee, *Quebec, Canada East.*—Proprietors.
Specimens of moose skins, dressed and undressed, prepared by the Indians of Lorette, near Quebec.

[The Moose, *Cervus alces*, furnishes an excellent hide for moccasins and snow-shoes; the best skin is from the bull moose in October, and usually sells for four dollars. The skins of the moose, the reindeer, *Rangifer tarandus*, and the buffalo, *Bison Americanus*, are tanned by the Indians of Canada and the United States. The hide of the buffalo is tanned and dressed by the women and children by a very laborious process: the skin is freed from its flesh by scraping, after which it is stretched on the ground and fastened with pegs to dry; the hair is scraped off, and the skin reduced to the proper thickness, when it is covered for a night with brains, liver, or grease; the next day it is rubbed in the sun or by a fire till the grease has been worked into it; then it is rubbed till quite dry. The skin is then suspended over a fire and thoroughly smoked, which completes the tanning, and renders the skin able to bear wet without losing its softness and pliability.

Buffalo robes are dressed in the same manner, only that the hair is not removed, and they are not smoked. The use of these robes for sleighs and other vehicles, for coats, mats, &c., is well known. Moose and reindeer skins are prepared in a similar manner.]

63. Clark, W. A., *Toronto, Canada West.*—Manufacturer.
Specimens of cochineal red and black roans, and of white lamb-skin linings.

64. Macklew, Oliver T., *Chippewa, Canada West*—Manufacturer.
Specimens of heavy Spanish sole leather.

65. Ferguson, William, *Montreal, Canada East.*—Inventor and Manufacturer.
Flexible leather branch pipe, composed of narrow strips of leather riveted together in a spiral direction.

66. Holwell, W. Antrobus, *Quebec, Canada East.*—Inventor.
The "Duplex Safety Rein" (patented in Canada, 1853), for insuring complete control of the horse in riding or driving, without needlessly curbing or fretting the animal, and with only one rein.

[This dispenses with one of the reins ordinarily used. A single leather rein is attached to the curb bit, with a short elastic connecting piece going from the main rein to the ring of the snaffle-bit. As long as the horse is quiet, the driver bears only on the snaffle-bit through the false rein; but if the animal is restive or hard-mouthed, he stretches the elastic connecting rein, and throws the pressure on the curb-bit and the main rein; on the horse becoming quiet again, the elastic rein contracts and throws the pressure off the animal's mouth on the snaffle-bit. For women or inexperienced drivers this is a valuable invention, as there is no danger of getting hold of the wrong rein in the confusion arising from a frightened horse.]

67. Lomer, J., *Montreal, Canada East.*—Manufacturer.
"Master-piece" sleigh robe, composed of 9,317 pieces of fur.

68. Hudson's Bay Company, *Hudson's Bay House, Lachine, Canada East.*—Proprietors.
A collection of furs, viz: two beavers, two black bears, one otter, one fisher, three martens, three minks, one silver fox, one cross fox, one red fox, three lynx, two raccoons, two black squirrels, six muskrats, and one seal; one dressed reindeer skin.

NEWFOUNDLAND.

69. Thomas, W. & H., *St. Johns.*—Collectors.
Skins and furs of white fox, wolverine, and cross foxes.

70. Bennett, C. F., & Co., *St. Johns.*—Collectors.
Skins of wolves, martens, red foxes, silver and black pole cats, muskrat, otter, and beaver.

71. Committee, *St. Johns.*—Collectors.
Skins of white fox, and martens.

72. Committee and Mechanics' Institute, *St. Johns.*—Proprietors.
Stuffed skins of red foxes, beavers, otter, ermine, northern hares, polar bears, and seals. (See 74.)

[Different species of seals are found in North America, from the coast of the Northern States to the Arctic Ocean. Great numbers of the skins are annually sent abroad, and consumed at home. Many are made into leather, which is enamelled and varnished for ladies' shoes. The blue-back, the hair, and the silver seals are dressed and used in their natural state, and are also dyed. The fur seal, the supply of which is always comparatively small, requires a long process to fit it for its intended uses; after the long coarse hair is removed, there remains the rich, curly, silky down, of a yellowish color, which was formerly much used for caps. It is now generally dyed of a rich Vandyke brown, giving it the appearance of the finest velvet; this is made up into a great variety of articles for ladies', gentlemen's, and children's wear. The species found on the coast of the United States is generally the *Phoca concolor*, and occasionally the Hooded Seal, *Stemmatopus cristatus*. The skins of the marine mammalia, when properly manufactured, are stronger than those of land animals; this remark applies particularly to seal, porpoise, and whale leather.]

73. Winter, Dr. John, *St. Johns.*—Exhibitor.
Small white-coat seal, stuffed.

74. Mechanics' Institute, *St Johns.*—Exhibitor.
Stuffed red foxes, beaver, otter, ermine, northern hares, groups of ptarmigan, ducks, owls, bitterns, great northern diver, gulls, seals, and polar bear.

[The immense tract of country in North America to the north of the United States, belonging to Great Britain, may be regarded as an immense hunting ground which supplies a great part of the furs used in Europe and America; the Northern and Western States and Territories also furnish a considerable quantity for home consumption. The following table of imports into England, and exports, is taken from J. A. Nicholay, Esq., of London:

Raccoon	525,000	all exported
Beaver	60,000	12,000
Chinchilla	85,000	30,000
Bear	9,500	8,000
Fisher	11,000	all exported
Fox, red	50,000	" "
" cross	4,500	" "
" silver	1,000	" "
" white	1,500	500
" grey	20,000	18,000
Lynx	55,000	50,000
Marten	120,000	15,000
Mink	245,000	75,000
Musquash	1,000,000	150,000
Otter	17,500	all exported
Fur seal	15,000	12,500
Wolf	15,000	all exported
EUROPEAN FURS.		
Marten, Stone	120,000	5,000
Squirrel	2,271,258	77,160
Fitch	65,091	28,276
Kolinski	53,410	200
Ermine	187,104	none exported

[The common American *Wild Cat*, or *Bay Lynx, Lynx rufus*, and the Canadian Lynx, *Lynx canadensis* (Loup-cervier of the Canadians), both have a light though warm fur; the natural color is a light grey spotted with dark, and rufous; dyed of various colors, it is considerably used for cloak linings, robes, muffs, &c. A skin will usually sell for three or four dollars. The specimens obtained of the former species, from the Columbia river, are generally carried direct to China without passing through the hands of European furriers. There is a variety of the first species, perhaps even a distinct species, *L. maculatus*, whose fur, spotted with brown, is as valuable as the others.

The skins of many species of *Hares and Rabbits* are valuable for common purposes of fur, on account of the almost inexhaustible supply. The most common American species are the *Lepus americanus, L. palustris, L. sylvaticus, L. Townsendii, L. glacialis, L. aquaticus*, and *L. nigricaudatus*. The colors vary from light grey to yellowish and reddish brown in summer; in winter white predominates. The fur of the polar hare, *L. glacialis*, is beautifully white and soft, and is sometimes substituted for ermine When beaver hats were worn, the felt bodies were made of rabbit skin; it is now dyed and made into a great variety of common articles. The wool has been recently made in England into a kind of cloth for ladies' wear.

The fur of the *Squirrel* is much used for linings, for tippets, and cuffs, for which its softness and cheapness make it in great demand. The varieties most in demand are the *Sciurus carolinensis, Sc. hudsonius, Sc. cinereus, Sc. lanuginosus, Sc. niger, Sc. migratorius*, and *Sc. capistratus;* of these the first three, or the Carolina, red, and eat squirrels, and the last three, or the black, grey, and fox squirrels, are the most esteemed. Immense numbers of squirrels are killed in Russia; as many as 23,000,000 are obtained there annually, of which more than 2,000,000 are exported to Engand.

The fur of the *Fox* is in high esteem in Russia and China. The skin of the red fox, *Vulpes fulvus*, is finer than that of the *V. vulgaris* of Europe; its value is from 2 to 3 dollars; that of the cross fox, *V. decussatus*, with a black cross on the neck and shoulders, and black line on the under surface, is valued at 12 or 15 dollars; the white and black varieties are also highly prized according to the uniformity or intensity of the color. The grey fox, *V. virginianus*, and the Kit fox, *V. velox*, have a much coarser fur. Fox fur is much used for sleigh robes, caps, and trimmings.

The fur of the *Muskrat*, or musquash, *Fiber zibethicus*, is of a reddish-brown color above, and cinereous beneath; it is short and downy, intermixed with longer and coarser hairs; it somewhat resembles that of the beaver, though it is less soft and lustrous. When the animal is killed in good season, it is an excellent material for making (so called) "beaver" hats, and great numbers of them were formerly used here, and exported to Great Britain, for that purpose; since the introduction of silk hats, the demand has been much less; in 1824 about 5,000 skins were exported to Great Britain. The value of a skin now varies from 25 to 6 cents. The geographical range of this animal is quite extensive, from 30° to 69° N.; for some unexplained reason, but very fortunately for the rice plantations, this animal is not found in the alluvial lands of South Carolina and Georgia, though it is met with much farther south inland.

The Wolverine or Glutton, *Gulo luscus*, ranges from 75° to 42° N.; it has two distinct kinds of hair, the inner fur being soft and about an inch long, the intermixed hairs being rigid and about 4 inches long. The fur resembles that of the bear, and is much used for muffs and sleigh robes.

The *Mink, Putorius vison*, has a very downy fur beneath, with hairs of a coarser kind interspersed; their skins were formerly much sought after for making tippets and muffs, being valued at 50 cents each; as the fashions change, they will doubtless soon be again worn, as the fur, though short, is finer even than that of the marten. Specimens are occasionally seen of a silver grey color, of great fineness; six of these will make a muff worth a hundred dollars. It is found in almost every part of North America

The fur of the *Fisher*, or *Pennant's Marten, Mustela canadensis*, is long, fine, and lustrous, darker in winter than in summer; it is not so valuable as the sable, the ordinary price being about $1 50 per skin. Its geographical range is between 40° and 70° N. across the continent

The *Beaver, Castor fiber*, whose skins were once a very important article of commerce, is now very scarce in the United States. In 1624, 400 beaver skins were exported from New York State; in 1635 the number had increased to 15,000, the whole number in ten years being over 80,000. In 1815 a party of Indians ascended a river in St. Lawrence county, and in a few weeks returned with 300 beaver skins. The Hudson's Bay Company in 1743 sent to London 150,000 beaver skins; in 1827, from more than four times the extent of country, the amount did not exceed 50,000. Beavers are caught in good order at all seasons of the year in the Rocky Mountains, as there it is never warm enough to injure the fur; in the low lands, however, along the Missouri, the trappers rarely commence their hunting before September, and relinquish it about the last of May. Sixty or seventy skins make a pack of 100 lbs., which is worth from three to four hundred dollars. Since the manufacture of beaver hats has been discontinued, the skins have lost much of their value. Its fine and silky wool has been adapted to weaving purposes in England, with some prospect of success. Its fur is prepared by a new process for ladies' wear, and is exported from England to various parts of Europe and the East; the white fine wool of the under parts is largely exported to France.

The fur of the *American Badger, Meles labradoria*, is considerably exported for general wear, for which its fineness and softness, especially from the back, peculiarly fit it. The European species is chiefly used for the manufacture of shaving brushes.

The fur of the *American Otter, Lutra canadensis*, is fine and thick, and ranks next in value to that of the Beaver, a good skin being worth 8 dollars; it is used for the finer sort of hats, and for costly caps. The hunting season is from September to May. The Russians, Chinese, and Greeks use a great many of these skins, for robes, trimmings, and national dresses.

The Ermine, *Putorius erminea*, has in summer a reddish-brown fur; in winter it is pure white, except the end of the tail, which is black. It so happens that royalty and nobility have adopted this fur in some countries, as one of their emblems, which has given to it a value far above its merit. It is made into various articles for ladies' wear, with the black tip of the tail attached; but it is not much handsomer, if it were not fashionable, than the imitations from cat and similar skins. The *Fitch*, or *Pole-cat*, of Europe, *Putorius fœtidus*, has a fur of good quality, which is considerably worn for common purposes.

The varieties of the *American Wolf, Canis lupus occidentalis*, have finer furs than the European species; the Prairie Wolf, *C. latrans*, supplies one of the furs of the Hudson's Bay Company. Wolf skins are used for sleigh robes, coats, caps, linings, &c., in cold climates, especially in Russia.

The fur of the *Black Bear, Ursus americanus*, is highly prized; a skin is worth from 4 to 12 dollars, according to the quality. It is much used for military caps and equipments, for sleigh robes and linings, rugs, &c. The fur of the polar bear, *U. maritimus*, is of the greatest value to the Arctic tribes; they dress it by pinning it down on the snow and leaving it to freeze, after which the fat is scraped off; it is then hung up to dry in the intense frost, and with a little scraping it becomes perfectly supple, both skin and hair being beautifully white.

The *American Sable* or *Pine Marten, Mustela martes*, has a fur varying in color from tawny to black; the ordinary skins are worth about $1.25 spiece. Great quantities of them are used on the continent of Europe; a mantle lined with black sables, with white spots, belonging to Henry I., was valued at $500. It is often colored to imitate sable.

The *Russian Sable, Martes zibellina*, is one of the most costly furs, both from its fineness, and the difficulties of procuring it amid the wilds of Siberia; it is rarely used except by kings and high functionaries. Russia alone produces about 25,000 annually.

The *Stone Marten, Martes albogularis*, is widely spread over Europe, and derives its name from its favorite haunts. The French excel in dyeing this fur, whence it is frequently called French sable.

The *Baum* or *Wood Marten, M. abietum*, frequents the pine forests of Europe; its fur is in the natural state coarser than that of the American sable; when dyed, it resembles the true sable.

The *Kolinski* or *Tartar Sable, Mustela siberica*, is procured from Russia; its natural color is a bright yellow, in which state it is much used; it is also dyed to imitate the cheaper sables.

The fur of the *Sea Otter, Enhydra marina*, is exceedingly fine and heavy. It is the royal fur of China, and is much esteemed in Russia, where it is used for collars, cuffs, and trimmings generally.

The fur of the *Chinchilla, C. lanigera*, a South American rodent, is remarkably soft, and is extensively used both in America and Europe.]

FRANCE.

75. Gauthier, J., *Montmartre, Paris.*—Manufacturer.
Varnished calf-skins, for carriages, and for boots and shoes.

76. Petterau, Placide, Jr., *Château Renault, Indre et Loire.*—Manufacturer.
Various samples of leather; a broad band for gearing machines.

77. Dezaux, Lacour, *Guise Aisne.*—Manufacturer
Specimens of tanned and curried hides.

[In this manufactory the spent bark, pressed and dried by the hydraulic press, is used for fuel for the boiler of a steam engine; very strong infusions of bark are used, obtained economically by directing the waste steam into the infusion-tank. The peculiar softness of French leather is in part owing to the use of the bark of the evergreen oak: and the strength and solidity of English sole-leather depends on the superior quality of the oak-bark abounding in England. It is probable that each tanning material gives to the leather some peculiar quality in respect to color, scent, toughness, and impermeability.]

78. Prin, A., Sen., *Nantes.*—Manufacturer.
Black and yellow calf-skins.

79. Didier, A. Petit, *St. Die.*—Manufacturer.
Calf-skins.

80. Gerard, Epinal.—Manufacturer.
Specimens of leather for carriages and harness.

81. Suser, H., *Nantes, Loire Inférieure.*—Manufacturer.
Tanned calf-skins.

82. Bayvet, Brothers, *Paris.*—Manufacturers.
Various specimens of leather, and of fine morocecos.

83. Courtois, E., *Paris.*—Manufacturer.
Specimens of black and colored calf skins for boots and shoes, and for saddlers, coach and harness makers; embossed and gilded leathers.

81. Dietz, Ed., *Bar, Bas-Rhin.*—Manufacturer.
Dressed calf skins.

85. Texier, G. Jun., *Mort Deux Lèvres.*—Manufacturer.
Superfine glove leathers.

86. Deadde, L., 12 *Rue Siquettone, Paris.*—Manufacturer.
Varnished leathers of various kinds and colors.

[The difficulty of making a bright varnish retain an unbroken surface on leather which requires to be bent, has been obviated in France by several processes. A paste made from vegetable black and Prussian blue, mixed with boiled linseed oil, is rubbed on the surface of the leather by hand, and dried in a stove at about 170° F. The operation is repeated from three to seven times; the varnish, when dry, adheres firmly and bears considerable tension without breaking. Another varnish is made by boiling linseed oil with white lead and litharge, one pound of each of the latter to a gallon of the former, and adding a portion of chalk or ochre; three or four coats are worked in to the skin, each one being thoroughly dried before the application of the next; ivory black is then substituted for the chalk or ochre, the varnish slightly thinned with spirits of turpentine, and five additional applications made, the varnish being put on thin, without being worked in; the leather is then rubbed down with powdered pumice stone, then varnished and placed in a room at 90°, out of the way of the dust. This last varnish is prepared by boiling half a pound of asphalt with ten pounds of the drying oil used in the first step of the process, and then stirring in five pounds of copal varnish and ten pounds of turpentine; it must have a month's age before it is fit for use.

An elastic varnish may be made by fusing together two parts resin, or elammar-resin, and one part caoutchouc, and stirred until cold; to add to the elasticity, linseed oil is added. Another is made by putting pieces of caoutchouc in naptha till softened to a jelly, adding an equal weight of heated linseed oil, stirred for some time over the fire.]

87. Corbet, Soucin, *Chaumont, Haute Marne.*—Manufacturer.
Calf skins, and dressed leathers.

88. Knoderer, Ch, *Rue des Dentelles, Strasbourg.*—Manufacturer.
Patent tanned and dressed leathers.

[By this process leather is tanned thirty or forty times quicker than by the usual mode. Calf skin is tanned in two days in summer, and in three days in winter—horse hide in three and four days—bootlegs and upper leathers in two or three days—bootlegs in cow-hides in six and eight days—calf skin legs in six and eight days. The leather is said also to have a better color, to be heavier, more elastic, and more impermeable to water.]

89. Houette, A. & Co., 27 *Faubourg Montmartre, Paris.*—Manufacturers.
Varnished calf skins; superfine grained skins.

90. Moride & Raux, *Nantes.*—Manufacturers.
Specimens of dressed russet and black calf skins.

91. Gaudelet, Fervar, 19 *Rue des Tanneries, Dijon.*—Manufacturer.
Specimens of white polished and varnished calf skins.

92. Galibert, C., *Milhau, Aveyron.*—Manufacturer.
Dressed russet and black calf skins; boot tops.

93. Alroy, Delon, *Faubourg St. Denis, Paris.*—Manufacturer.
Specimens of varnished calf skins.

94. Manson, *Nantes.*—Manufacturer.
Specimens of fine dressed calf skins and boot tops.

95. Nys & Co, *Paris.*—Manufacturers.
Samples of superfine japanned leather.

96. Chavey & Bouchet, *Paris.*—Manufacturers.
Dressed calf skins.

THE GERMAN STATES.

97. Doerr & Reinhart, *Worms on the Rhine.*—Manufacturers.
Japanned patent leather, for shoemakers, and for furniture; with boots made from it.

98. Hirschfeld, Herrmann, *Cothen.*—Manufacturer.
Varnished leather, belts, hat bands, &c.

99. Heintze & Freudenberg, *Weinheim, Baden.*—Manufacturers.
Japanned, black, and polished leather, for boots and shoes.

100. Viessino, Edward, *Coesfeld, Westphalia.*—Manufacturer.
Specimens of morocco and colored leather.

101. Paetorius & Co., *Alzey, Hesse-Darmstadt.*—Manufacturers.
Specimens of dressed calf skins; boot fronts.

102. Rupp & Bechstein, *Frankfort on the Maine.*—Manufacturers.
Patent varnished leather, for shoes, belts, &c.

103. Geyer, William & Edward, *Eisenberg, Saxe-Altenburg.*—Manufacturers.
Prepared leather for instruments.

104. Heyl, Coanelius, *Worms on the Rhine.*—Manufacturer.
Patent leather and calf skins.

105. Ostertag, Carl, *Nordlingen, Würtemberg.*—Manufacturer.
Chamois leather, and white alum-dressed leather.

106. Bartholme, F., *Ansburg, Bavaria.*—Manufacturer.
Vellum and parchments.

[Parchment is made from the skins of sheep and goats. After being limed, stretched, scraped, and pared, powdered chalk is rubbed on with pumice stone, which smooths and softens the skin, and gives the desired color; it is then dried. Vellum is a substance similar to parchment, made from the skins of very young calves.]

108. Kugler, J. G., *Nuremberg, Bavaria.*—Manufacturer.
Fancy articles in leather.

109. Stalm, Robert, *Breslau, Prussia.*—Manufacturer.
A complete set of Hungarian harness.

110. Boysen, *Bremen, North Germany.*—Manufacturer.
Specimens of saddlery and harness.

111. Schadow, Ferd., *Breslau, Prussian Silesia.*—Manufacturer.
Leather travelling trunks, pouches, bags, &c.

112. Stieb, *Nuremberg, Bavaria.*—Manufacturer.
A variety of whips.

113. Lewzenfelder, P. Sen., *Nuremberg, Bavaria.*—Manufacturer.
Riding and carriage whips of various descriptions; curiously mounted canes and whips.

114. Goetze, Hermann, *Leipsic.*—Manufacturer.
Tresses and braids of human hair, of various colors.

[Hair chemically consists of carbon, hydrogen, oxygen, and nitrogen, united with several earthy and metallic oxyds. It is well adapted for ornamental work from its fineness, elasticity, strength, and resistance to decay. Its manufacture into ornamental and useful articles gives employment to great numbers of workmen on the continent of Europe, especially Germany, France, and Belgium: the lighter varieties, which are the most valuable, are principally obtained in Germany, the darker varieties from France. A head of hair, such as is bought of the peasant girls in these countries, usually weighs from ¼ to 1½ lbs., and is usually exchanged for trinkets and articles of dress.]

115. Herdigen, H., *Nuremberg, Bavaria.*—Manufacturer.
Sample card of assorted bristles, with price current.

THE AUSTRIAN EMPIRE.

116. Pollack, J. J., & Sons, *Prague, Bohemia.*—Manufacturer.
Black and brown grained and pressed calf-skins; japanned and varnished leathers; reindeer leathers; various colored calf-skins; cap beaks; chamois skins; calf-skins dressed with the hair on.

[The manufacture of leather is a very important branch of Austrian industry, especially tawed and chamois leather. Much of the raw material is imported from Russia, the Danubian Principalities, Turkey, and Buenos Ayres; the annual quantity consumed is nearly 1,000,000 cwt. The production of leather of all kinds amounts to about 600,000 cwt. Prague and Vienna are famous for the manufacture of ladies' gloves; in Vienna alone, there are more than 250 makers who employ 500 workmen and 3,500 female sewers, making annually about 200,000 dozen pairs of gloves; in Prague there are about 50 glove makers. The manufacture of fancy articles of leather is also quite extensive in Vienna and Prague; large exports are made, especially to Turkey.]

117. Wolff, F., *Hermannstadt, Transylvania.*—Manufacturer.
Samples of different kinds of goat and sheep skins, stamped with variously colored painted figures.

[The art of embossing leather is of great antiquity. The straps from the Theban mummies, in the fineness and beauty of the figures, prove great skill in the workmen; some of these bear the names of kings who reigned more than 3,300 years ago. The Egyptians used for tanning the pods of the *Acacia nilotica.*]

118. Messner, F., *Reutte, Tyrol.*—Manufacturer.
Samples of different kinds of leather.

119. Locker, Antonio, *Krainburg, Illyria.*—Manufacturer.
Samples of horse-hair sieve bottoms.

120. Globotsching, A., *Strasich, Illyria.*—Manufacturer.
Horse-hair sieve bottoms.

121. Lang, F., *Stadt-Steyer, Austria.*—Manufacturer.
Camel-hair brushes.

THE ITALIAN STATES.

122. Arnaudon, Luigi, *Turin, Sardinia.*—Manufacturer.
Specimens of morocco leather of various colors.

123. Megroz-Blache, *Thonon, Sardinia*—Manufacturer.
Specimens of calf skins, undressed, dressed, and varnished.

124. Lanza, G., *Turin.*—Manufacturer.
Specimens of sole, bridle, and harness leather.

125. Sangler, Francesco, *Turin.*—Manufacturer.
Portmanteaus and trunks of new form, with many compartments.

SWITZERLAND.

126. Hediger, Brothers, *Zug, Canton Zug.*—Manufacturers.
Fine dressed calf skins and japanned leather.

127. Melchior, Imhoff & Son, *Bâle, Canton Bâle.*—Manufacturers.
Polished calf skins, and specimens of boot fronts, à la Bordeaux.

128. Reymond, Henry, *Morges, Canton Vaud.*—Manufacturer.
Black and white polished calf skins.

129. Mercier, Jean Jacques, *Lausanne.*—Manufacturer.
Fine dressed calf skins; black and russet.

BELGIUM.

130. Jorez, L., Jun., *Brussels.*—Manufacturer.
Specimens of varnished coach and harness leathers.

131. Bouvy, Alex., *Liége.*—Manufacturer.
Samples of fine leather, boot fronts; carpets made of cows' hair.
[A cloth is also made from buffalo hair by the American Indians.]

132. Duchaussoit, Edward, *Ghent.*—Manufacturer.
Muffs and pelerines; natural and dyed skins.

133. Dewewevene, Joseph J., *Ghent.*—Manufacturer.
Specimens of dyed and printed skins.

134. Hansens-Hap, Benoit, *Vilverde, Brubant.*—Manufacturer.
Horse-hair and aloe-fibre stuffing for furniture, &c.; aloe-fibre stuff of two surfaces; table cloths; prepared bristles, &c.

THE NETHERLANDS.

135. Dyksman, H., *Rotterdam, Netherlands.*—Manufacturer.
Hair cloth for chairs and sofas.

[The preparation of hair for the manufacture of damask hair cloth consists essentially in steeping it in alkaline liquid, after which it is dyed. It is woven in an ordinary loom, and hot-calendered; hair ropes are formed like other ropes; curled hair acquires its permanent tortuous springy character by boiling. Formerly the warps for hair-seating were made of linen, but now cotton is much used, as it produces a cloth of a smoother, more pliable, and more even surface. Hair seating is woven by hand, every hair being introduced singly; the weft being in detached pieces, it has been found that power looms cannot be used with advantage The weaver uses a sort of hook-shuttle, which he passes between the threads of the warp, or "shed," towards his left hand; the assistant places a single hair over the end of the hook, and the weaver draws it through the warp; making it a tedious process. Worsted warp is sometimes used.

Williams gives the following recipe for a varnish for converting fibrous materials into "artificial hair:" it is made by dissolving ten to forty parts of hog's bristles in one hundred parts of linseed oil varnish; the cloth is to be immersed in the liquid, and then dried at a moderate heat.]

136. Wild, P. de, Jr., *Laandau, Netherlands.*—Manufacturer.
Hair sacks for oil manufacturers.

137. Catz, P. S. & Co., *Amsterdam, Netherlands.*—Manufacturers.
Swan and geese and grebe skins dressed after the Dutch method; various fine dressed skins.

[The Grebe, *Podiceps cristatus*, is an aquatic bird, inhabiting most countries of Europe, Asia, and North America. The best specimens are from Holland and Switzerland. The feathers are of a rich silver-white color, variously shaded with brown, and are much esteemed as ornaments and trimmings of ladies' dresses; they are very durable.]

SECTION III. CLASS XVII.

PAPER, PRINTING, AND BOOKBINDING.

This class includes paper of every description; all articles of stationery; types and specimens of printing, not including fine art printing; and bookbinding in leather, cloth, vellum, &c. The manufactures arranged under this class, and the improvements constantly made in them, are of surpassing interest to the scholar, on account of their connection with the spread of knowledge and with the intellectual wants of man. The application of recently improved machinery to the production of paper, and of printed books, leaves scarce anything to be desired on the score of economy of materials, and the excellence, rapidity, and cheapness of manufacture. In bookbinding, great advances have been made in the durability and beauty of the embossed cloth covers, now almost universally used by publishers. The appearance of the cloth covers is much more commendable, and being manufactured by machinery, their cost is scarcely more than that of the boards in which books were formerly issued. In leather binding, no advances have been made corresponding to those in paper-making and printing. The expense of good leather binding is usually greater than the original cost of the volume. With one or two laudable exceptions, the specimens of bookbinding, in leather, in the Exhibition, do not rise above mediocrity. The reader is referred to an essay on this subject in the Illustrated Record, page 37.

New York and Philadelphia send numerous specimens of printed books, in several of which the printing, illustration, and paper, are deserving of high praise. The letter papers from South Hadley and Lee, Massachusetts, are of superior quality; and the American paper for blank books and ledgers excels in fineness and smoothness the heavy English paper a few years ago regarded as indispensable. In the finest kinds of note paper, foreign articles still take the lead. Of about 1700 paper mills in the United States, only three send specimens of their products.

The moulds, punches, and types made in New York, and the stereotype plates from Boston, show great perfection in these arts; the gutta percha moulds and types give promise of an extensive application of this highly useful article. The writing inks, and stationery articles, are of a superior character.

Great Britain exhibits some elegantly bound books, and fine specimens of typography; a great variety of excellent paper from Kent, and an extensive assortment of fancy and ornamental stationery from De la Rue, of London; a great variety of metallic pens from the manufactory of Mr. Gillott, of Birmingham. The books printed in relief for the use of the Blind are very interesting, though inferior to those used in the United States, made under the direction of Dr. S. G. Howe, specimens of which, unfortunately, were not exhibited. The Zollverein exhibits a great variety of books from the prolific press of Leipsic; fine printing inks; gold, silver, and fancy papers; playing cards; lead pencils and drawing materials from Nuremberg. France sends specimens of fine printing, plain and in colors; types; stereotype plates in papier maché; common and photographic paper; inks and elegant fancy stationery; paper made from straw; specimens of bookbinding and photographic printing. From Holland are sent glyphographic galvanic copper-plates, and chromotypographic proofs from the same; and an assortment of drawing papers. Austria sends specimens of oriental punches and types, for which Vienna has long been famous; and excellent lead pencils. Italy exhibits fine lithographs and specimens of printing, and excellent paper from Turin and Florence.

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1. Putnam, G. P., & Co., *Park Place, New York.*—Publishers.

An extensive collection of elegantly bound American books published by the exhibitors, embracing works of the principal American authors, in belles lettres, history, science, practical arts, and education; together with illustrated works in exemplification of the various styles of engraving in the United States. Specimens showing the various styles of binding and printing, and qualities of paper. (For an account of bookbinding, see Record, page 37.)

2. Lippincott, Grambo & Co., *Philadelphia, Penn.*—Publishers.

Books as specimens of printing and binding, including a volume of Schoolcraft's Indian Ethnology, presented by the United States Government to Her Majesty Queen Victoria: highly ornamental.

3. Walker, E., & Sons, *New York.*—Publishers and Bookbinders.

Bibles, prayer-books, classics, histories, magazines, and various other works, as specimens of substantial and elegant bookbinding, with examples of richly illuminated pictorial edges.

4. Root & Anthony, *New York.*—Manufacturers.

A variety of fine blank books, in substantial and elegant bindings.

5. Bowne & Co., *New York.*—Manufacturers.

Bank ledgers in full Russia binding, highly ornamented; letter and note paper; specimens of printing in colors.

6. Dunigan, Edward, & Brothers, *New York.*—Publishers.

A case containing Roman Catholic Bibles and other books, published by the exhibitors, in rich bindings.

7. Koch & Co., *New York.*—Manufacturers.

Specimens of blank books in a superior style of binding, ruling, and finishing; embossed covers and gilt edges.

8. Norton, Charles B., *New York.*—Publisher.

A variety of books, in various styles of binding.

9. Strinoea & Townsend, *New York.*—Publishers.

Specimens of richly bound books.

10. Matthews, William, *New York.*—Manufacturer.

Specimens of very fine bookbinding in Russia, morocco, and calf; specimens of

edge tooling; flexible binding for dictionaries and books of reference. Elegantly bound copy of Owen Jones's Palace of the Alhambra, in light Russia, illuminated, with blue and red morocco; exhibited as a specimen of the artistic abilities of the bookbinder to ornament his work without the aid of the engraver and jeweller, on whom of late years he has principally depended for rich ornament. Six months' labor was bestowed on the ornament alone; the binding cost the exhibitor $500. (For representation of this book, see Record, page 23.)

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11. BAKER, GODWIN & Co., *New York.*—Printers.

Books, pamphlets, bills, cards, in plain and ornamental styles.

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12. ROSE, WILLIAM W., *New York.*—Manufacturer.

Bank and office ledgers, and account books in ornamental bindings.

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13. FRANCIS & LOUTREL, *New York.*—Manufacturers.

Specimens of account books, in full Russia binding; Francis's improved manifold letter writers; Croton writing and copying inks; diaries for 1854; tracing paper; prepared gum.

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14. FESTNER, FREDERICK C., *New York.*—Manufacturer.

Specimen of elegant bookbinding, with gilt and illuminated edges.

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15. MAURICE, WILLIAM H., *Philadelphia, Penn.*—Manufacturer.

Ledger and journal; highly ornamented, with gilt edges.

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16. FELT & HORSFORD, *New York.*—Manufacturers.

Full-bound account books, ledgers, and journals, ornamented with silver. Cheeks, inkstands, fancy stationery; specimens of lithography, &c.

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17. DEJONGE, J. & L., *New York.*—Manufacturers.

Specimens of fancy colored, glazed, enamelled, figured, and marbled papers, for the use of bookbinders, printers, and box makers.

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18. MANN, FRANKLIN, *New York.*—Manufacturer.

Marbled and fancy colored papers.

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19. THOMPSON, WILLIAM M., *New York.*—Engraver.

Large collection of specimens of bookbinders' pictorial stamps, printed in gold on fine leather.

[The method of engraving these stamps gives an effect of light and shade which is said to be almost equal to copperplate. Twenty thousand copies on dry cloth may be taken without destroying the beauty of the impression.]

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20. BRUCE, GEORGE, *New York.*—Manufacturer.

Samples of moulds, punches, type, and specimens of typography.

A ring-tailed mould, as engraved and described in "Moxon's Mechanick Exercises," London, 1683, and still in common use in Europe; by it a workman casts on an average 4,000 types in ten hours. A lever hand mould, patented by Archibald Binney, of Philadelphia, in 1814, and in general use in the United States till superseded by power machines; by it about 6,000 types are cast in ten hours. A modern mould, to be attached to a type-casting machine; a workman, with a machine, will average 18,000 types in ten hours. And the following specimens of type:

BODY.	FACE.
Twenty line Pica.	Ornaments.
Sixteen " "	"
Fourteen " "	"
Twelve " "	Roman.
Ten " "	Antique.
Nine " "	Roman, No. 3.
Eight " "	Shaded, No. 2.
Seven " "	Ornamented.
Six " "	Gothic Open.
Five " "	Antique extra con'd.
Four " "	Gothic.
Canon.	Open.
Meridian.	Shaded.
Double Paragon.	Roman and Italic.
Double Gt. Primer.	Gothic condensed.
Double Columbian.	Roman and Italic.
Double English.	Antique extended.

BODY.	FACE.
Double Pica.	Shaded, No. 2.
Double Small Pica.	Running-hand.
Paragon.	Ornamented, No. 3.
Great Primer.	Antique.
Columbian.	Roman and Italic.
English.	Script.
Pica.	Newspaper Ornam'ts.
Small Pica.	Rom. and Ital. No. 5.
Long Primer.	Church Text.
Bourgeois.	Title.
Brevier.	Rom. and Ital. No. 5.
Minion.	Rom. and Ital. No. 3.
Nonpareil.	Gothic, No. 2.
Agate.	Title Roman.
Pearl.	Roman, No. 3.
Diamond.	Roman, No. 2.

Some ten line Pica condensed matrices.
" four " " shaded "
" ten " " " "
Small Pica matrices, Roman lower case, "a" to "ffl."
Steel punches of Ornaments.
" " of Double Small Pica Running-hand.
" " of Brevier, No. 3, caps and lower case.

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21. TOBITT, JOHN H., *New York.*—Manufacturer.

Specimens of combination type, or logotypes.

[It is found that a greater speed in type-setting is secured by having a few of the most common syllables cast on united instead of separate bodies. By means of electrotyping, this improvement can be applied to existing fonts at trifling expense. By this plan the exhibitor has composed 2,000 ems per hour.]

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22. NEWTON COMPANY, *New York.*—Manufacturers.

Patent copper-faced type, common and music.

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23. BOSTON STEREOTYPE FOUNDRY, *Boston, Mass.*—Manufacturers.

Case containing specimens of electrotype work.

1. An "electro-felted cotton stamp," for marking cloths.

[The felt filling is designed to soak up and retain the coloring solution used for the purpose, until pressed upon the cloth, when it exudes and flows to the edges, and gives a clear and clean impression. The difficulty of making a water solution flow evenly over a metal letter is entirely obviated in the construction of this stamp.]

2, 3, 4, 5. Four pages of a work entitled "Arthur's Temptation," electrotyped from "English."

6. A comic illustration, electrotyped from wood engraving.

7. A "shell" of the same, not "backed."

8. An impression from a page of type ("English") ready to receive the copper deposit.

9. A *cut* electrotyped from wood engraving, and blocked upon mahogany.

10. Newspaper head, electrotyped from wood engraving, and blocked on a solid metal body.

11, 12. Two pages of "Colonial Records of the Massachusetts Bay in New England," from the original manuscript, electrotyped from "Small Pica."

13, 14. Two pages of Gould & Lincoln's Catalogue of Publications, electrotyped from "Pearl."

15. Page with rule, electrotyped from "English."

16. One line of "Pearl" type, electrotyped, and fitted to solid body same size.

17, 18. Two pages with running title, electrotyped from "Small Pica."

19. The "Adams Medal"—silver.

20, 21. Electrotyped moulds of the same.

22, 23. Electrotyped copies of the medal.

24. An engraved brass plate.

25. An electrotyped mould of the same.

26, 27. Copies of the brass plate taken from the mould, No. 25, sixteen plates having previously been deposited in the same mould.

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24. BILL, STARK & Co., *Willimantic, Conn.*—Manufacturers.

Specimens of wood type, cut by machinery, principally from box wood and mahogany; single letters of different sizes, and combinations, plain and ornamented.

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25. ZEVELY, E. S., *Pleasant Grove, Maryland.*—Manufacturer.

Wood type; wood stamps for post offices; model of cheap proof press.

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26. KINGSLEY, JOHN L., *New York.*—Inventor, Patentee, and Manufacturer.

Specimens of gutta percha patent stereotype plates and moulds; with printing from the same.

[Gutta percha plates will work a large impression with letter-press; when wood cuts are expensive, the originals may thus be saved. They may be quickly made, and at a trifling cost. The gutta percha mould is made by laying on the substance warm, and applying pressure for about fifteen minutes in a screw press; when the mould is taken out, brush it over with plumbago, lay it on the press face up, and put warm gutta percha into it; apply pressure as before. Several plates may be got from the same mould. Copper may be deposited in the gutta percha mould by the electrotype process; the advantage of electro-stereotype over stereotype is, that it will last much longer and work much cleaner. The printed pages from the gutta percha plate are very clean and distinct, and the letters have a very sharp outline. Stereotype plates have also been made of papier maché, which are much used by French printers.]

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27. GROSSMAN, E. N., & SONS, *New York.*—Printers.

Specimens of letter-press and wood-cut printing.

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28. KETTERLINUS, E., *Philadelphia, Pennsylvania.*—Printer.

Specimens of fancy printed and embossed show cards, and envelopes.

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29. LOHMANN, WILLIAM, *New York.*—Printer.

Typography in gold and silver colors.

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30. MURPHY, WILLIAM, *New York.*—Manufacturer.

Specimens of velvet show-card printing and embossing. Patent blotters; adhesive mixture.

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31. NESBITT, GEORGE F., & Co., *New York.*—Proprietors.

Specimens of letter-press printing; plain, ornamented, and colored cards, in large gilt frame.

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32. LEAVITT & ALLEN, *New York.*—Publishers.

Knapp & Rightmeyer's works on Plain and Ornamental Penmanship.

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33. WILLIAMS, JAMES B., & Co., *Glastonbury, Conn.*—Manufacturers.

Specimens of writing inks.

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34. LEACH, EDWIN, *Pawtucket, Rhode Island.*—Manufacturer.

Samples of writing ink.

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35. MAYNARD & NOYES, *Boston.*—Manufacturers.

Specimens of writing inks.

[The ink of the ancients consisted of some carbonaceous substance united with a viscid or gummy liquid; the black liquid ejected by the *Sepia* or cuttle-fish was also used. Modern ink is made from salts of iron, with various astringent vegetable infusions; the best materials are sulphate of iron and nutgalls, suspended by mucilage of gum arabic. Other ingredients, as logwood, sulphate of copper, and sugar, are sometimes added. Fading of ink depends commonly on the removal of the gallic acid and tannin; the black color may be revived by moistening the page with an infusion of galls.

A black ink may be made by boiling 125 parts of rasped logwood with water enough to yield 1000 parts of the decoction, and when cold by stirring in 1 part of

yellow chromate of potash; it is a beautiful blue-black color, without any precipitate. It is free from acid, and does not corrode steel pens, but it does not flow so freely from the pen as the old solution of the tanno-gallate of iron, which has not as yet been improved upon.

A blue and black indelible ink may be made by dissolving in a solution of iodide of potassium as much more iodine as it contains, and pouring the solution into one of yellow prussiate of potash containing as much of the solid prussiate as the whole amount of iodine. Soluble Prussian blue is precipitated, and the iodide of potassium remains in solution. After filtering, the precipitate is dissolved in water and forms a blue ink, containing no free acid, and therefore adapted for steel pens. If this soluble blue be added to common black writing ink (from galls), the result is a black ink which cannot be removed without destroying the paper.]

36. GREEN, T. H., *Trenton, New Jersey.*—Manufacturer.

Specimens of superior India-rubber ink eraser and paper cleanser; soap India-rubber; scented India-rubber cloth for destroying moths.

37. DEMAREST, A., *New York.*—Engraver.

Embossed advertising business envelopes.

38. DAVIDS, THADDEUS, *New York.*—Manufacturer.

Sealing wax of every variety of color; wafers and ink in great variety.

[Sealing wax is made from rosin and different kinds of *lac*—stick lac, a secretion from trees punctured by an insect (*coccus lacca*), in the form of a reddish-brown substance, of a crystalline fracture, enclosing the insect—shell lac, produced from this—lac-dye, exported from the East Indies to England, Germany, Russia, &c.

The coloring matter for red sealing wax is vermilion, or sulphuret of mercury.

Wafers are made of flour, isinglass, yeast, and white of eggs, dried in thin layers upon tin plates, and cut out by a circular instrument; they are colored by red lead, &c. The oldest seal, by a red wafer, which Mr. Spiess, a German antiquarian of the eighteenth century, was able to find, was on a letter written at Spire, in 1624, to the government at Bayreuth]

39. FRERE, THOMAS, *New York.*—Manufacturer and Agent.

A collection of valentines of embossed lace paper, ornamented with emblems, devices, and bijouterie.

40. LONG, FREDERICK A., *New York.*—Manufacturer.

Specimens of embossed cards and envelopes.

41. MALCOLM & HOSFORD, *New York.*—Manufacturer.

Conversation and amusement cards, in various styles.

42. LYON, CHARLES H., *New York.*—Manufacturer.

Specimens of fancy note papers, and envelopes of enamelled laid and wove papers; embossed, silvered, and ornamented in rich and new designs.

43. EAVES, WILLIAM, *New York.*—Manufacturer.

Embossed self-sealing envelopes, business cards, and adhesive labels.

[Since the invention of machines for folding envelopes, the consumption of these articles has enormously increased; a machine invented by De la Rue, of London, folds 2700 per hour, which is only a little less than the number folded per day by an experienced workman with a "folding stick."

Since the introduction of penny postage into England the number of letters has quadrupled; in round numbers, in 1850, the number of letters dropped daily into the post-offices of the United Kingdom, was one million per day, five-sixths of which were enclosed in envelopes; so that annually three hundred millions of envelopes pass through the post-office, besides which an equal number is probably used in private conveyance.

When the system of penny postage shall be introduced into this country, there will be a much larger proportionate increase even than in England.]

44. PERSON, IRA B., *New York.*—Manufacturer.

Specimens of card writing in pencil and ink.

45. WARD, S. S., MRS., *New York.*—Proprietor.

Log of the "Savannah," the first steamship which crossed the Atlantic; with a silver tea-kettle presented to Captain Rogers, bearing the following inscription: "Presented to Captain Moses Rogers, of the steamship Savannah, being the first steam-vessel that had crossed the Atlantic, by Sir Thomas Graham, Lord Lyndoch, a passenger from Stockholm to St. Petersburg. September 15, 1819."

46. WHITWELL, JOHN C., *Brooklyn, New York.*—Agent.

Prince's spring fountain pen.

47. CAREW MANUFACTURING CO., *South Hadley Falls, Mass.*—Manufacturers.

Specimens of fine writing papers; pearl white, white and blue laid, congress letter, mercantile post; wove and ruled, &c.

48. PLATNER & SMITH, *Lee, Mass.*—Manufacturers.

Various styles of writing papers; cream and blue wove and laid; ruled and unruled.

[Paper is made from flexible fibres reduced to a pulp by minute division by the cutters of a revolving cylinder. The pulp is bleached by chloride of lime, small quantities of which remain in the paper and injure its quality; it is entirely removed by sulphide of sodium, which is converted by chlorine and water into muriate and sulphate of soda.

The various machines for making paper in continuous lengths consist of contrivances for making the paper pulp flow on the surface of a wire web, a rapid up and down motion being communicated in order to shake out the water, and produce a close interweaving of the fibres; the sheet thus formed is turned on to a second covered with felt, condensed by a third, and finally delivered to the drying rollers. Paper is sized by passing it through a solution of gelatine or glue; this strengthens it by filling the interstices, and prevents the ink from spreading; in blotting paper the sizing is omitted. Swedish filtering paper is made with pure water, and is purer than any other; being, in fact, pure *cellulose*, yielding less than one half per cent. of ash on incineration.

The usual method of glazing paper is by passing it between rollers of polished steel; when the rollers are heated the paper is called *hot-pressed;* sometimes the glazing rollers are made of an immense number of discs of highly sized paper cemented firmly together by a hydraulic press *Laid* papers are those with a ribbed surface; *wove* papers are those with a uniform surface; blue paper, under the microscope, no longer appears of a uniform tint, but the particles of coloring matter appear widely separated.

A *waterproof* paper may be prepared by treating "half stuff" alternately with soap-suds and a solution of sulphate of alumina, which produces an aluminous soap in the pulp; the sheets, after drying, are sized with glue.

Tracing paper may be made by dipping a sheet into a thick solution of gum arabic, and pressing between two dry sheets, thus rendering all three transparent. When dry, it is much superior to the oiled paper; it can be written and painted upon; it impresses the traced lines upon linen or paper.

Paper was first made of cotton or silk, and was called *bombycina;* linen was not used till the fourteenth century. Paper making may be considered as a chemical as well as a mechanical process; by the combination of chemical and mechanical means, even the most refuse articles, as straw, grasses, refuse of sugar cane, wood shavings, are profitably converted into paper. The wood of the *Pinus abies* is used in Germany for the manufacture of paper; it is reduced to a pulp, and a small quantity of linen added; this makes a fine paper, not requiring sizing. It is not so white as that made from rags, but is excellent for printing, especially in colors, and for pasteboard.]

49. VICTORIA MILLS. Agents: CYRUS W. FIELD & CO., *New York.*—Manufacturers.

Specimens of fine letter and note paper; white and blue laid cap and letter, ruled; white and blue laid Bath post, &c.

50. PECK, SARAH ELIZABETH, *Westchester, New York.*—Proprietor.

A bible, of the Tyndale edition, printed in London, England, A.D. 1551.

51. CLIFT, WILLS, *New York.*—Proprietor.

A bible brought over in the ship Mayflower, by the great-grandfather of the exhibitor, S. Clift, one of the Pilgrims who landed at Plymouth, Mass., in December, 1620.

[The ship Mayflower sailed from Plymouth, England, September 6, 1620, and reached a place on the coast of Massachusetts, which the Puritans afterwards called Plymouth. The whole number on board, including women and children, was 101. The Puritans left England in 1608, on account of religious persecution, and took refuge in Holland; after a residence of 11 years at Leyden, finding themselves subject to much inconvenience from ignorance of the language and aversion to the habits of the Dutch, they resolved to emigrate to America. They chartered two small vessels, in one of which they sailed from Delfthaven, July 22, 1620, and joined the other at Southampton. From a leaky condition of one of the vessels, they finally sailed with only one, the Mayflower, and landed at Plymouth, Mass., December 22, 1620.]

GREAT BRITAIN AND IRELAND.

52. BOHN, HENRY GEORGE, *York street, Covent Garden, London.*—Publisher.

A collection of elegantly bound books: embracing Bohn's Standard Library, 81 vols.; the Illustrated Library, 21 vols.; the Classical Library, 41 vols.; the Scientific Library, in 25 vols.; the Antiquarian Library, 19 vols.; and 4 extra volumes.

Also, splendid editions in folio, of Selby's British Ornithology, 2 vols.; Galerie du Palais Pitti, 4 vols.; Silvestre's Universal Palæography, 2 vols.; Costumes of the Scottish Clans, 1 vol.; Illuminated Books of the Middle Ages; Froissart's Chronicles, 2 vols. 8vo.; Catlin's North American Indians, 2 vols.; London, 3 vols.; Bryan's Dictionary of Painters and Engravers.

53. SETON, ROBERT, *Edinburgh.*—Manufacturer.

An elegantly bound, embossed, and gilt folio volume, "Scotland Delineated."

54. LUMLEY, EDWARD, *High Holborn, London.*—Manufacturer.

Specimens of books and plates.

55. LINDSAY, JOHN, *Maryville, Blackrock, Cork.*—Manufacturer.

Original works, 3 vols., and a pamphlet; coins of England, Ireland, and Scotland.

56. Marcel, Claude, *Cork.*—Author.
Original work on languages, in 2 vols.

56 *a.* Ward, Marcus, & Co., *Belfast, Ireland.*—Publishers.
Notices of Chinese seals found in Ireland, by Edmund Getty. Illustrations of the North of Ireland, and Guide to the Giant's Causeway. Five chromo-lithographic drawings representing an Irish ecclesiastical bell, which is supposed to have belonged to St. Patrick; and the several sides of the jewelled shrine in which it is preserved.

57. Bogue, D., *London.*—Proprietor.
Specimens of a new work on industrial art, by "Luke Limner."

58. Figgins, Vincent and James, *Smithfield, London.*—Manufacturers.
Specimens of new and fancy types, Greek and Oriental characters, &c.; in a quarto book.

59. Stephenson, Blake, & Co., *Sheffield, England.*—Manufacturers.
Specimens of impressions from their printing types.

60. Fleming, A. B., & Co., *Leith, Scotland.*—Manufacturers.
Specimens of printing with Scottish printing ink.

61. London Society for teaching the blind to read, *Avenue Road, Regent's Park, London.*—Manufacturers.
Embossed books, music, maps, geometrical figures, with chess board and games for the use of the Blind.

[The characters used for letters are raised above the surface of the paper, that the sense of touch may supply the want of sight; they are very simple, being a straight line, a curved line, and a dot placed in different positions, thus avoiding the complication of strokes in the letters. Greater rapidity of reading is secured by the use of contractions similar to those used in short-hand. An adequate knowledge of the system can easily be acquired in six months. The system was proposed by the late Mr. Lucas, of Bristol, and reduced to practice by the Rev. T. W. Gowring in 1842, under the direction of the Society. The greater part of the Scriptures, the liturgy of the Church of England, and many books for instruction, have been published in these characters.

The raised characters of the music denote both the sound and its length, thus dispensing with the staff. In the maps, the land is raised above the sea, and the cities, mountains, rivers, and boundary lines, may be easily felt.

The chess boards have the black squares raised, and the pieces are fastened to them by pegs; the black pieces are distinguished by a point at the top.

The invention of characters in relief was early resorted to for teaching the blind. Mr. Gall, of Edinburgh, invented an alphabet on this principle, called the "triangular;" movable letters in grooves were afterwards used. Haüy invented the art of printing in relief. The advantages of Mr. Lucas's system are: the avoidance of repetition of numerous letters, and the simplicity of the characters; particles are mostly represented by initial letters.

In 1833, the Perkins Institution for the Blind was established in Boston, Mass., by the munificence of the late Thomas H. Perkins, Esq. Dr. S. G. Howe, who was placed at its head, contrived an alphabetical system, taking Haüy's invention as the basis. By removing all the flourishes and points about the letters, and reducing them to the minimum size and elevation, he made a very compact and cheap form; so great was the reduction that the whole New Testament, which, in Haüy's type would fill 9 volumes and cost $100, could be printed in 2 volumes at an expense of less than $4. This system is extensively, if not exclusively, adopted in the United States; seventeen States have made provision for the education of their blind, and these books, from the prevalence of education, are in very great demand. Dr. Howe uses the common Roman letter of the lower case.]

62. Newberay, James and Richard, *London.*—Manufacturers.
Gold, silver, and colored foils, and fancy papers, for bookbinding; gilt and enamelled screen handles, &c.

63. Rudd, John W., *London.*—Manufacturer.
Specimens of bookbinding.

64. Wilson, James Leonard, *London.*—Manufacturer.
Cloth for bookbinding, variously colored, plain, watered, and marbled.

65. Haughton, John, & Co., *Chiswell street, London.*—Manufacturers.
Specimens of bookbinders' cloths, bound in a folio book.

66. Saunders, Thomas H., *Queenhithe and Dartford, Kent, England.*—Manufacturer.
Bank note, cheque, and water-marked writing papers, in great variety. This method of preventing forgeries is patented.

[Various methods have been resorted to for the prevention of forgery, by printing in chemical water colors, producing two colors at a time, the lettering being in black, and the ornamental back ground in a neutral tint. Any signature upon such paper cannot be erased without changing the color; the letter-press on the note cannot be transferred or copied, and is printed on a prepared paper.

The water-mark on paper has, till recently, been confined to the ribbing of laid papers, or the peculiar mark of the manufacturer. Ornamental designs are now produced by means of wires or brass plates sewn on the hand-mould, or the dandy rollers of the paper machine.]

67. Cowan, A., & Sons, *Edinburgh and London.*—Patentees.
Specimens of paper; cream and blue laid post; bank post, demy, &c.

68. Pollard, George, *London.*—Manufacturer.
Plain and ornamental envelopes and wafers; visiting cards.

69. De la Rue, Thomas, & Co., *London.*—Manufacturer.
Specimens of playing cards; wedding and visiting cards; letter and note papers; envelopes of all descriptions; drawing and fancy papers; music, drawing, and sketch books, and albums; writing desks and cases; portfolios, and an extensive general assortment of stationery. Iridescent films for purposes of decoration.

[The vivid colors of these films are due simply to the agency of light on a thin transparent film of varnish. The process adopted to render the film and its reflected colors permanent, together with its application, is as follows:

The objects to be ornamented, whether insects, shells, birds, bronzes, paper hangings, card cases, &c., are immersed in a vessel of water. Upon the surface of the latter, when perfectly tranquil, is dropped a little oil or spirit varnish, which, spreading in all directions, becomes exceedingly attenuated and reflects the most vivid colors. The varnish being fixed, the object, which is then raised slowly in such a manner that the film shall adhere to its surface, is then placed in a convenient situation to prevent the water draining off. When completely dry, the film is found to be firmly attached and perfectly iridescent, having lost nothing of its original brilliancy of coloring.

This is a beautiful illustration of the production of color on a thin transparent surface by the agency of light, such as is transiently seen in an ordinary soap-bubble.]

70. Hollingworth, Thomas & John, *Turkey Mills, Maidstone, Kent.*—Manufacturers.
Drawing, writing, and printing papers.

[Considerably more paper is made in England than in Scotland and Ireland. Kent is famous for its fine writing and drawing papers; much is also made in Lancashire, Berkshire, Hereford, and Derbyshire. The amount of paper manufactured in England annually, three years ago, amounted to about 132,000,000 lbs.; in 1834, it was little more than half that quantity; in 1839, it was estimated that the quantity used, if equally divided among the population, would have been about 3¾ lbs. for each person. The substitution of machines for hand labor has greatly reduced the price of paper; a ream of paper which, in 1801, cost 36 shillings, in 1843 could be bought for less than half that sum. Coarse brown paper was first made in England in 1588; writing and printing paper were not made there till 1690, previous to which it was imported from the continent.]

71. Bainbridge, R., & Co., *London and New York City.*—Manufacturers and Importors.
An assortment of plain and ornamental note papers, envelopes, inkstands, and other articles of stationery.

72. Goodall, Charles, & Sons, *Camden Town, London.*—Manufacturers.
Specimens of playing cards, in colors, with ornamental backs.

73. Dunn, Thomas, *Glasgow, Scotland.*—Inventor and Manufacturer.
Circular time-table, or revolving calendar and calculator.

74. English, Andrew, *Dublin.*—Author.
Specimens of ornamental penmanship.

75. Gillott, Joseph, *Victoria Works, Birminghom.*—Inventor and Manufacturer.
Metallic pens, steel, gilt, and gold; and pen-holders, in great variety of patterns. A colossal pen three feet long, and tiny pens of half an inch in length.

[The establishment of Mr. Gillott has been in operation more than thirty years; it employs upwards of 500 hands, of which four-fifths are females. The steel is obtained from Sheffield; it is cut into strips, and the scales are removed by immersion in dilute sulphuric acid. After it has been reduced to the proper thickness by being passed through rollers, the blank is cut out with a bed and punch; the hole which terminates the slit is then pierced, and any superfluous steel is removed; they are then annealed in a muffle, and the maker's name is impressed on them. Up to this time they are flat; they are now made concave or barrel-shaped by a press, according as they are nib or barrel pens. They are then heated to redness, plunged into oil, and tempered, and finally brightened by being placed in a revolving cylinder with sand or other polishing substance. The nib is then ground, and the slit is made by a press having a descending chisel. The pen is then complete. The coloring is given by placing them in a metal cylinder revolving over a charcoal stove, and removing them when the exact color is arrived at; the brilliancy is given by immersion in lac dissolved in naphtha, and subsequent drying by heat. Gold pens, not being acted on by the ink, seem almost indestructible; their durability is maintained by attaching to the point, by soldering, minute portions of iridium and osmium, the hardest metals known.]

76. Brookman & Langden, *London.*—Manufacturers.
Assorted drawing pencils.

77. Hyde & Co., *London.*—Manufacturers.
Specimens of red sealing wax.

BRITISH COLONIES—CANADA.

78. Valade, Francis, *Longueil, Canada.*—Author.
A literary, political, and religious manuscript journal, from 1789 to 1853.

FRANCE.

79. Derosiers, T. A., *Moulenis.*—Publisher.
Specimens of printing, in five folio volumes, "Ancient Auvergne."

80. Roussel, Charles, *Besançon.*—Printer.
Specimens of typography.

81. Barbat, *Chalons-sur-Marne.*—Printer.
Rich and varied specimens of chromo-lithographic printing; specimens of fine printing upon thin sheets of wood.

82. Meyer, Ernest, *Paris.*—Printer.
Various specimens of printing in colors, and in gold and silver

83. Dupont, Paul, *St. Honore, Paris*—Proprietor.
A work, entitled "Essai Pratique d' Imprimerie," or Practical Essay on Printing.

84. Gauthier, P. Fr., *Paris.*—Manufacturer.
New and patent style of typographical characters, with bearing blocks, vignettes, &c. Brass type for bookbinders' use.

85. Curmer, Alex., *St. Germain, Paris.*—Stereotyper.
Stereotype made of papier maché, much used in the French libraries.

86. Locullier, Bertrand, *Paris.*—Engraver.
An assortment of metallic punches for printing Javanese characters and German script. Frames containing various specimens of typography.

87. Blanquart, Evrard, *Lille.*—Manufacturer.
Frames containing fine specimens of photographic printing; reproductions of engravings.

88. Dujardin, *Arcueil.*—Engraver.
Specimens of wood engravings.

89. Niedrée, *Paris.*—Manufacturer.
Specimens of bookbinding.

90. Castelle, Paul, *Paris.*—Manufacturer.
Various samples of gelatine or glacé paper.

91. Marion, A., & Co., *Paris.*—Manufacturers.
Ornamental note paper and eovslopes; papéterie and fancy stationery; inkstands, paper weights, and stereoscope; photographic paper.

[The positive photographic paper of M. Marion is prepared with hydrochlorate of ammonia; it is free from stains and traces of iron, and other substances injurious to photographic operations. It has been objected to it that it is too thin and delicate; but it is strong enough to go through the necessary baths without tearing, and it is even strengthened by the immersion. The thinner the paper is, if it be sufficiently strong, the smoother it is, and the better adapted to reproduce the most delicate tints of the plate.
The negative paper is ready for immediate use.]

92. Vanderdorpel, Jr., *Paris.*—Manufacturer.
Gilt, and silver lithographed and colored papers; fancy borders, and a variety of paper ornaments.
(For a treatise on lithography, see the Record, p. 131.)

93. De Serlay, C. G., *Gueurs, Seine Inferieure.*—Manufacturer.
Specimens of envelope papers.

94. Deusy, F., & Co., *Paris.*—Manufacturers.
Samples of straw and packing pasteboards.

95. Blanchet, Brothers, & Kleber, *Rives, Isere.*—Manufacturers.
Drawing papers of all descriptions. Bristol boards; fine letter paper in great variety.

96. Stegmueller, C., *Paris.*—Manufacturer.
Various samples of portfolios.

97. Blauzy, Poube, & Co., *Boulogne-sur-Mer.*—Manufacturers,
Metallic pens of different kinds.

98. Mangin, F. L., *Bruyeres, Vosges.*—Manufacturer.
Various specimens of inks.

99. Biard, Jules, *Paris.*—Printer.
Specimens of engravings on white zinc-surfaced paper; specimens of cards, and printing, plain and colored, on surfaces of zinc white.

[The base of the zinc-white paint, invented in 1842, by M. Leclaire, of Paris, it appears from these specimens, may be advantageously substituted for lead in the enamelled surfaces of cards; besides its freedom from poisonous qualities, it has the advantage of not turning black, as does the surface of ordinary cards, under the influence of coal gas, or sulphurous and other exhalations.]

100. Carré, *Paris.*—Manufacturer and Inventor.
Specimens of a new kind of wafer, of various sizes and colors, called "carréotype;" the advantage of this method of sealing is that it takes admirably the impression of a seal.

101. Coupier & Mellier, *Paris.*—Inventors and Manufacturers.
Specimens of paper made entirely from new straw.

THE GERMAN STATES.

102. Weber, J. J., *Leipsic, Saxony.*—Producer.
Two illustrated works, *Illustrirte Zeitung*, in 7 vols. folio; and *Naturgeschichte des Thierreichs*, by Edward Pöppig.

103. Reimer, Dietrich, *Berlin.*—Publisher.
Various works on architectural design and ornaments by Zahn and Hessemer. Herculaneum, Pompeii, and Stabiæ.

104. Teubner, B. G., *Leipsic, Saxony.*—Manufacturer.
Set of the Leipsic Greek and Latin classics; bibles and other books.

105. Brockhaus, T. A., *Leipsic, Saxony.*—Printer.
Two hundred volumes printed within one year in the office of the exhibitor.

106. Badeker, J., *Iserlohn, near Eberfeld, Prussia.*—Publisher.
Bibles, geographical works, &c.

107. Pieber, H. A., *Altenberg, Saxe-Altenberg.*—Proprietor.
Universal Lexicon: 34 vols. in 17; supplement, 4 vols. in 2.

108. Viewig, F., & Sons, *Brunswick.*—Publishers.
A great variety of scientific and miscellaneous books.

109. Merz, J., *Nuremberg, Bavaria.*—Proprietor.
Dr. F. W. Ghillany's History of M. Behaiw, and the part he took in the discovery of America, with a treatise on the oldest maps and designation of America, by Alexander Von Humboldt.

110. Von Arnelunxn, Brothers, *Wolbeck, Westphalia.*—Manufacturers.
Specimens of printing ink; news ink, machine or press; book-work ink; superior book-work ink; woodcut, lithographic, and noir leger inks.

111. Wissenbach, C., *Frankfort-on-the-Maine.*—Manufacturer.
Samples of printers' inks; blacks in a dry state. Black, for copperplate printing, of different sorts; lamp-black, calcined, for lithography; lamp-black, from pine calcined, for varnishing; varnish-black, to be employed in oil; real ivory-black (Berlin-black), Paris-black, vive-black, and Frankfort-black, to be employed in oil; paste-black, dissolved in liquid, for paper hangings, &c.

[Printers' ink is made chiefly of lamp-black and oil reduced by boiling; oil is necessary to prevent drying during the operation of inking and printing. Rosin oil is sometimes used instead of linseed oil, with rosin, yellow soap, &c. A great many formulæ are given for making lithographic ink; one of the most common is made of equal parts of tallow, wax, shell lac, and common soap, with about one-twentieth part of lamp-black—the wax and tallow are heated in an iron vessel till they take fire, when the other materials are added; the burning is allowed to continue till the compound is reduced one-third.]

112. Heinrigos, J., *Cologne.*—Publisher.
Volume of engraved specimens of calligraphy or penmanship.

113. Fischer, C. F. A., *Bautzen, Saxony.*—Manufacturer.
Various specimens of paper and paste-board; plate paper; tissue paper, of all colors; bank note and document papers; mill-boards for railway carriages.

[This exhibitor has two factories, which contain three endless machines, twenty-four hollanders, two satining machines, moved by five turbines and six water wheels of 150 horse power; they employ about 200 men, and produce about 1,300,000 lbs. of paper annually.]

114. Haeule, Leo, *Munich, Bavaria.*—Manufacturer.
Gold and silver paper and borders; samples of bronze-colored printing.

115. Karcher, F., *Carlsruhe, Baden.*—Inventor and Manufacturer.
Pounce paper, a transparent drawing, tracing, and modelling paper, made by a new and peculiar process.

[This paper is very cheap, transparent, soft, and free from any oily or other

objectionable substances. It may be used like any other drawing paper, may be stretched on the drawing board and frame, and will bear painting in water colors, china inks, varnish, &c.]

116. Wust, Brothers, *Darmstadt, Hesse-Darmstadt.*—Manufacturers.
Specimens of colored, gold, silvered, and fancy papers.

117. Dessaner, Alois, *Aschaffenburg, Bavaria.*—Manufacturer.
Gold, and silver, and colored papers; velvet, embossed, marbled, and fancy papers, printed in colors.

118. Bauch, Brothers, *Heilbronn, Wurtemberg.*—Inventors and Manufacturers
Specimens of paper which, by a new process, is colored differently on the two sides of the sheet: note and letter and folio papers.

119. Dittberner, A, *Breslau, Prussia.*—Manufacturer.
Fancy, gilt, and colored papers.

120. Kraamer, H. Ed., *Leipsic, Saxony.*—Manufacturer
Labels, for merchants and manufacturers; plain and colored.

121. Freund, E. A., *Offenbach-on-the-Maine.*—Manufacturer.
Varieties of enamelled, colored, and glazed carded paper.

122. Weser, T. B., *Offenbach-on-the-Muine.*—Manufacturer.
Specimens of card board and glazed paper.

123. Frommann, M., *Darmstadt, Hesse-Darmstadt.*—Manufacturer.
Specimens of playing cards.

124. Schaeffer & Scheiar., *Berlin.*—Manufacturers.
Samples of ornamental papers; fancy embossed cards; medallion wafers, &c. (The plates from which these papers are printed, are electrotypes from papier machè moulds). Oil colored printings.

125. Stern, William, *Fürth, Hesse,* Manufacturer.
Specimens of gold and silver papers.

126. Renter, Wolfgang, *Darmstadt, Hesse Darmstadt.*—Manufacturer.
A variety of playing cards, of various colors.

127. Bartholme, Frederick, *Augsbury, Bavaria.*—Manufacturer.
Paper and parchment, of various colors.

128. Luneburg, F. H., *Hamburg.*—Manufacturer.
New style of manifold letter writer.

129. Ebenauer, Edward, *Nuremberg, Bavaria.*—Manufacturer.
Prepared metallic writing tablets, of slate sizes.

130. Eberbach, *Nuremberg, Bavaria.*—Manufacturer.
A variety of plain and fancy colored wafers.

131. Wolter, Carl, *Breslau, Prussia.*—Manufacturer.
Newspaper holders.

132. Klett, Theo. Cramer, *Nuremberg, Bavaria.*—Manufacturer.
Cedar pencils, arranged in the form of the American arms.

133. Faber, A. W., *Steiv, near Nuremberg, Bavaria.*—Manufacturer.
Various specimens of black lead pencils, with drawings made by the same; fine graduated drawing, and colored lead pencils; colored chalks; drawing materials and instruments.

[Black lead pencils are made from plumbago, graphite, or black lead—different names given to a form of carbon, containing sometimes a portion of iron; this well known soft material consists of from 85 to 98½ per cent. of carbon. The wood is red cedar obtained from North and South America.

134. Froescheis, S. *Nuremberg, Bavaria.*—Manufacturer.
Specimens of drawing pencils, graduated, and of various shapes and qualities.

135. Stadtler, *Nuremberg, Bavaria.*—Manufacturer.
Lead pencils and drawing chalks of various qualities and kinds.

THE AUSTRIAN EMPIRE.

136. Raffelsperger, Franz, *Vienna.*—Printer.
Specimens of types and matrices, in various oriental languages.

137. Hardtmutt, L. & C., *Vienna.*—Manufacturers.
Specimens of black lead pencils.

138. De Castro, Vincenzo, *Milan.*—Editor.
Book of prayers.

THE ITALIAN STATES.

139. Fontana, Alessandro, *Turin.*—Printer.
Don Pirlone a Roma, in 3 vols. 4to; Memoirs of an Italian, by M. Pinto; the same work in 3 vols. 8vo., illustrated by 300 copper plates and 50 wood cuts, of political caricatures.

140. Chiais & Mina, *Turin.*—Printers.
A large volume, containing a historical description of Hautcombe Abbey, printed by the exhibitors, richly ornamented with engravings on every page, folio.

141. Gianini & Fiore, *Turin.*—Booksellers.
Fine lithographic tableaux, representing all the works of Canova, the drawings by M. Fanoli.

142. Societa Cartaria, *Florence, Tuscany.*—Manufacturers.
Specimens of writing paper in great variety.

BELGIUM.

143. Gyselynck, F. & E., *Ghent.*—Publishers.
Illustrated books; genealogical history of certain families in Flanders, folio; Le Jardin Fleuriste, 8vo.

144. Muquardt, C., *Brussels.*—Publisher.
Illustrated books; architectural monuments of Belgium, folio, 2 vols; Book of illustrations, in 8vo.

145. Parent, F., *Brussels.*—Publisher.
A variety of books, in paper covers.

146. Van Hemeleyk, Brothers, *Hal, near Brussels.*—Manufacturers.
Samples of writing and printing papers.

THE NETHERLANDS.

147. Zweesaardt, A., *Amsterdam.*—Printer and Binder.
Two books in 4to, viz: Antiphonarium Romanum, and Graduale Romanum: volumes of printed music, being masses and vespers of the Romish Church as used in the Netherlands.

148. Blusse, Brothers, *Dordrecht.*—Printers.
Bibles of the Netherlands Bible Society, with music for the hymns.

149. Abrahams, Brothers, *Middleburg, Netherlands.*—Manufacturers.
Counting-house books, &c.

150. Sythoff, A. W., *Leyden, Netherlands.*—Printer.
Specimens of printing.

151. Binger & Sons, *Amsterdam.*—Inventors.
Glyphographic-galvanic copper blocks for printing, with chromotypographic proofs from the same; of various sizes, and illustrating different branches of knowledge.

[Glyphography, or galvanoglyphy is the process in which a drawing is etched on a zinc plate coated with varnish; several coats of ink are spread over the plate by a small composition roller, being deposited only on those parts where the varnish has not been broken through by the graver; when the hollows are deep enough, the plate is placed in connection with the galvanic battery, and the result is another plate in which the hollows of the engraving are produced in relief. This process was invented and patented in England; in many cases it has been found to be superior to wood engraving, but it has not been extensively used.]

152. Wilson, & Co., *Meppel.*—Printers.
Imitation of leaves by the printing press.

153. Honig, Breet, C. & J., *Zaandyk, Netherlands.*—Manufacturers.
Samples of drawing papers.

154. Blok, P. & Son, *Waddingsveen.*—Manufacturers.
Wrapping, ship-sheathing, and cartridge papers.

HAYTI.

155. Emperor of Hayti.—Proprietor.
Specimens of paper made from the Banana tree.

SECTION III. CLASS XVIII.

DYED AND PRINTED FABRICS, SHOWN AS SUCH.

The fabrics arranged under this class are exhibited to show the skill of the dyer and the color-printer. These arts, which were once empirical only, have received from the researches of chemists a scientific basis and development. The experiences of practical men have been revised by the careful and systematic investigations of the laboratory, and in the majority of instances, a great economy of time, labor, and materials has resulted. New chemical compounds and new substances have been discovered, and new methods of combining old and well-known dyes and colors. Great advances have been made also in the methods of fixing colors and developing their brilliancy. In consequence of these important contributions of chemical science, it is now almost the universal custom of large dyers and printers to attach to their works a laboratory, in which special researches may be conducted, to advance their resources and commercial prosperity.

In the present Exhibition the display of dyed fabrics is unfortunately very small. The specimens, however, show the best results of the art, both those derived from chemistry and those depending upon improvements in printing machinery. The lawns, calicoes, mousseline de laines, &c., shown by the print-works of Massachusetts, Rhode Island, and New York, will compare favorably with similar productions from any country. It is much to be regretted that England and France, which are especially skillful in dyeing and color-printing, exhibit none of their productions. Scotland sends a few examples of Turkey-red dyeing and calico-printing. Switzerland exhibits a variety of beautifully dyed fabrics; Austria, excellent examples of dyed silks and yarns; and Italy, Turkey-red cotton and yarn of brilliant color.

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1. Hamilton Woollen Company, *Southbridge, Mass.*—Manufacturer. Agents: Merriam, Brewer & Co., *Boston and New York.*

Cashmeres, mousseline de laines, and woollen furniture cloths, printed by machine, in numerous colors, with copper shells; manufactured from American staples—cotton warp and wool filling.

[The ten-color cashmeres for furniture cloths are believed to be the first which have ever been produced entirely by machine-printing. The printing of mousseline de laines differs in many points from that of calicoes, as the different nature of the material renders it possible to employ more brilliant colors, and to select from a much wider range. The colors in mousseline de laine printing are also fully printed on the cloth, requiring no after-dyeing to complete them, being fixed and brightened solely by exposure to steam. Formerly the colors were applied by a process called block-printing, closely resembling type-printing. A block of wood or metal, engraved with the requisite pattern, received the color, which was impressed by hand on the fabric; as every color required a different block, a complicated pattern made this process exceedingly tedious. It is occasionally employed where great accuracy of coloring and sharpness of definition are required, in the more costly fabrics.

This tedious and expensive process gave way to printing with copper plates on a printing-press, and the plates in their turn were replaced by the present system of copper rollers. The last change, the greatest step of all, was the invention of the first Sir Robert Peel, father of the celebrated statesman. From printing one color by one roller, ten colors are now printed at once from ten rollers, ranged successively in a powerful machine, and printing hundreds of yards a day.

When the pattern to be printed is decided on, it is given to the "sketchmaker," who arranges it to fit the rollers on which it is to be engraved, and makes a separate drawing of each color. These are handed to the engraver, who either proceeds to cut them directly on the rollers, or on a small steel die, the size of the pattern, and one quarter, one sixth, or some other proportionate part, of the diameter of the roller. This die after being engraved is hardened by tempering, and a reverse of it taken off in a powerful press on a second steel roller, which is called the "mill." This is, in its turn, hardened, and impressed by a similar process on the copper roller, until the latter is covered with the impressions.

The necessary copper rollers to form the pattern being prepared, they are adjusted in the printing machine, and the color is applied to the under side of each of them. When they are set in motion, they, of course, bring up color on their surfaces as they revolve in the box which contains it. This color is scraped off of all the plain surface of the rollers by a sharp steel blade, called a "doctor," before it reaches the top, where the impression is given, only leaving color in the engraved figures, into which the cloth is heavily pressed by an enormous iron roller, covered with a thick blanket. Thus the cloth passing successively from roller to roller, receives the full impression of the figure—which, however, is only given in what is called the "*mordant*," and which needs to be dyed in order to show the proper color. This mordant is usually some mineral or vegetable salt, which, in combination with madder, will produce certain colors, or fix the coloring matter of the madder in the cloth, and these various mordants being duly printed, the various colors are brought out with one dyeing operation.]

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2. Dunnell, Jacob & Co., *Providence, Rhode Island.*—Manufacturer.

Specimens of roller-printing on lawns, calicoes, bareges, mousseline de laines, and pongee silk.

[Calico-printing was commenced in the United States about thirty years ago, since which time the greatest improvements have been made. It was introduced into England from France about 1675; France obtained it from Central Germany, and the latter derived it from Egypt and the East.]

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3. Rennie, Robert, 14 *Cedar Street, New York City.*—Manufacturer.

A variety of fine printed fabrics of various materials, exhibited in an elegant cabinet made of American woods.

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4. Merrimack Manufacturing Company, *Lowell, Massachusetts.*

Madder prints, in various colors, dyed with American madder from Massachusetts and Georgia.

[The works of this company and those of Mr. Dunnell are the largest in the United States. The statistics of Lowell for 1853 give their production of printed goods per annum as 17,420,000 yards. They employ 2,300 operatives, and consume 86,000 lbs. of cotton per week. They also consume annually 1,000,000 lbs. of madder, 380,000 lbs. of copperas, 60,000 lbs. of alum, 40,000 lbs. of soap, 50,000 lbs. of sumac, and 45,000 lbs. of indigo. The goods exhibited are dyed with American madder, and the colors are considered fully equal to those from the best French madder.]

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5. Burk, James, Jr., 44 *Maiden Lane and* 7 *South Front Street, New York City.*—Manufacturer.

Printed and extracted cloths, cassimeres, and satinets; dyed, printed, and carded flannels; dyed, printed, and embossed muslins and cotton fabrics.

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6. Mason & Lawrence, *Boston, Massachusetts.*—Agents.

Specimens of fine printing on calicoes.

7. American Print Works, *Fall River, Massachusetts.*—Manufacturers.
Specimen of calico and mousseline de laine prints.

8. Manchester Print Works, *Manchester, New Hampshire.*—Manufacturers. Agents, J. C. Howe & Co., *Boston, Massachusetts.*
Specimens of printed mousseline de laines.

[These are goods of a finer cloth than those of No. 1, but of the same general style and design. The works at which they are produced are the largest de laine works in the United States, and produce about 1,200 pieces per diem. The production of these goods in the United States is very large, and the market for the ordinary qualities of the half cotton goods is principally supplied from the American mills.

The art of dyeing consists in impregnating textile fabrics with coloring matters which shall be permanent under ordinary circumstances. This is effected by producing a chemical union between the fabric and the color. Different materials absorb coloring matters in different proportions; wool seems to have the greatest attraction for coloring substances, then silk, cotton, hemp, and flax.

Dr. Bancroft called *substantive* colors those which communicate their color without the aid of a third substance; *adjective* colors require the aid of a *mordant*, a third substance, possessing an attraction for the coloring matter and the fabric, and thus capable of fixing the color. The principal mordants are salts of iron, alum, and tin; the acetate of alumina, the persulphate and acetate of iron, muriate and sulphate of tin, nitrates of iron and copper, stannate of soda, basic acetate of lead, and Broquette's new mordant of a solution of caseine in ammonia. The fabrics are first impregnated with the mordant, and then passed through the dye.

The principal dye-stuffs can only be enumerated here, full descriptions being accessible in any work on dyeing. The vegetable and animal dyes are *indigo*, obtained from the *Indigofera tinctoria*, for blues; *arnatto*, from the washings of the fermented seeds of the *Bixa orellana*, of the East and West Indies, for yellows; *archil*, a violet paste, from various species of lichens—brilliant, but not permanent, to give a purple finish to silks and woollens—rarely used for cottons; *bar-wood*, *cam-wood*, *Brazil wood*, for reds; *catechu*, an extract from the *Mimosa catechu* of the East Indies, for browns; *cochineal*, a red dye from a female insect found on a species of cactus; *French berries*, from a species of *Rhamnus*, for a bright yellow; *fustic*, or *Morus tinctoria*, a permanent yellow, with an aluminous mordant; *lac dye*, giving to wool a brilliant scarlet color, with a mordant of iron; *logwood*, naturally red, giving all colors, from light purple to black, with an alum mordant, and from lilac to black, with an iron mordant; *madder*, the root of different species of *Rubia*, extensively used in printing cotton goods of a variety of shades, from bright red and lilac to purple, chocolate, and black, with different mordants; *quercitron*, from the bark of the black oak, for yellows, drabs, orange, and olives; *safflower*, from the *Carthamus tinctorius*, for dyeing silk and cotton of a rose color; *turmeric*, for dyeing silk yellow; *weld*, the *Reseda luteola*, for permanent yellows, with alum or tin mordants; and *woad*, whose coloring matter seems identical with indigo.

The principal mineral colors are: antimony orange; chrome yellow, or chromate of lead; chrome orange, or subchromate of lead; manganese brown, hydrated peroxide of manganese; orpiment sulpharsenious acid, a bright but alterable yellow; iron buff, peroxide of iron; prussiate of copper, delicate cinnamon color; red prussiate of potash, Prussian blue; and Scheele's green, arsenite of copper. Various other compounds are used, which space does not permit to be mentioned here.]

9. Wilmer, Cannell & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Fine silk handkerchiefs, printed on Indian fabrics.
[These goods are specimens of block-printing.]

GREAT BRITAIN AND IRELAND.

10. Stirling, William, & Sons, *Glasgow, Scotland.*—Manufacturers.
Specimens of Turkey-red dyeing and printing upon cotton fabrics.

[Turkey red is obtained by a tedious process from madder. Turkey red is the most durable vegetable color known, and is supposed to have been discovered in India, whence it passed into other parts of Asia and Greece. About the middle of the last century this color was introduced into France by some Greek dyers; towards the end of the century a Turkey-red dye-house was established in Manchester by M. Borelle, a Frenchman. A better process was introduced into Glasgow by M. Papillon, another Frenchman. The greater part of the Turkey-red dyeing of Great Britain is still executed in the Glasgow district. It is principally obtained from Greece, and the amount used is almost incredible. The brilliancy of the color varies considerably in different localities, depending on some peculiarities of manipulation, qualities in the water used, and in the material itself, and other circumstances not well ascertained.]

11. Ewing, A. O., & Co., *Glasgow, Scotland.*—Manufacturers. Agents: Sturgis, Shaw & Co., *New York City.*
Turkey-red cambric and furniture prints.

THE GERMAN STATES.

12. Weyermann, A., *Elberfeld.*—Manufacturer.
Turkey-red and rose-colored cotton yarns.

THE AUSTRIAN EMPIRE.

13. Salzer, Carl, *Vienna.*—Dyer.
Specimens of dyed silks, in a great variety of beautiful colors; tableau of colored silks, representing the arms of Austria.

14. Walter, F., *Vienna.*—Dyer.
A variety of samples of dyed woollen yarns.

ITALY.

15. Parodi, Brothers, *Genoa, Sardinia.*—Dyers.
Samples of Turkey-red cotton and yarn, of brilliant and enduring color.

SWITZERLAND.

16. Ziegler, T., & Co., *Winterthur, Canton Zurich.*—Manufacturers.
Colored and printed cotton cloths, and red velvet.

17. Greuter & Rieter, *Winterthur, Canton Zurich.*—Manufacturers.
Plain, twilled, and printed Turkey-red cotton.

[The Swiss possess about 250 dyeing factories for thread and woollen stuffs. The Turkey-red dyeing establishments are famous. Canton Zurich alone has fourteen. Cantons St. Gall, Glaris, and Thurgovie also manufacture largely, and of fine quality, and produce considerable quantities of goods for exportation.]

18. Meyer, C., Jr., *Wippingen, Canton Zurich.*—Manufacturer.
A great variety of richly printed cottou tissues, furniture materials, damasks, Foulard silks, shawls, &c.

SECTION III. CLASS XIX.

TAPESTRY, CARPETS, LACE, AND EMBROIDERY, ETC.

The present class includes a great variety of articles, widely different from each other in their appearance and the materials from which they are made. All or nearly all of them, however, were originally made by hand with a needle, and it is only of late years that many have been manufactured by machinery. Some of the most beautiful and striking results of mechanical ingenuity are seen in this class in the machine-made lace, embroidery, and carpets. The machines themselves seem almost to possess the faculties of intelligent creatures, and to be endowed with a share of their inventors' reason.

Examples of the beautiful productions of hand labor, wrought by patient and tasteful artizans, or, rather, artists, are also represented in this class. Such are the famous tapestries from the royal manufactories of Gobelins and Beauvais, for the first time exhibited to an American assemblage. For a satisfactory sketch of these establishments, and the processes of manufacture, the reader is referred to the Illustrated Record, page 136. An example of each is engraved in the same work. The Irish sewed muslin embroidery forms a part of the Exhibition, of unusual interest and beauty.

1. Lowell Manufacturing Company, *Lowell, Massachusetts.*—Manufacturers.
Power-loom superfine ingrain and three-ply carpets and rugs.

[The mills of the Lowell Carpet Company are the largest in the country, and use a capital of $2,000,000. They employ 1,300 workpeople, use 200 power-looms on carpets, and produce 1,300,000 yards of three-ply ingrain carpets annually, and consume 3,452,000 lbs. of wool.]

2. Bay State Mills, *Lawrence, Massachusetts.*—Manufacturers.
Printed felt carpets, of various designs.

3. New England Worsted Company, *Troy, New York.*—Manufacturers.
Tapestry and velvet carpetings.

[Carpets are composed wholly or partly of wool, and are made in several ways. The simplest form is composed of a striped woollen warp on a thick woof of linen thread, as in the so-called *Venetian* carpets. *Kidderminster*, or *ingrain* carpeting, is composed of two webs, each consisting of a separate warped woof; the two are interwoven at intervals to produce the figures, as the two webs are passed at intervals through each other, each part being at one time above and at the other below; when different colors are used the figure will be the same on both sides, but the colors will be reversed—these are made entirely of wool. *Brussels* carpeting has a basis composed of a warp and woof of strong linen thread; in the warp there is added to every two threads of linen ten threads of woollen of different colors; the use of the linen is to bind the worsted together, and it is not visible on the upper surface. The woollen threads are from time to time drawn up in loops to form the figures; each row passes over a wire, which is withdrawn without cutting the yarn; in the *Wilton* carpeting the yarn is cut; in the *Turkey* carpets, which are made entirely of wool, the loops are larger and always cut—the cutting of the yarn gives the appearance of velvet; Wilton carpets are thus in fact only Brussels carpets. A *three-ply* carpet has three thicknesses of cloth; each is perfect in itself, so that if one cloth were cut away, the other (if it were a two-ply) would remain perfect, resembling a coarse baize. Till recently hand-looms were only used in the manufacture of carpets; the substitution of the power-loom has greatly facilitated the process.]

4. Bigelow Carpet Company, *Clinton, Worcester Co., Massachusetts.*—Manufacturers. Agent: Henry P. Fairbanks, *Boston, Massachusetts.*
Power-loom Brussels and Wilton carpetings; specimens of coach lace from the Clinton Company.

[These specimens of carpeting are woven by a steam power-loom, invented and patented by Mr. Bigelow. Many attempts had been made in England to effect this object, but without success. This loom will weave of five-frame Brussels carpeting twenty yards a day, requiring the attendance of only one person; while the hand-loom will produce on an average only five yards a day, and requires, besides the weaver, a person to attend to the wires which raise the pile. Besides economy of labor, the goods are woven with more regularity and with a smoother and more even surface; a saving of material is effected by the greater tension of the worsted. In 1851, there were in the United States 28 of these looms at work on five-frame Brussels carpeting, 50 on tapestry carpeting, and 450 on ingrain, or Kidderminster carpeting.

E. B. Bigelow, Esq., formerly of Lowell, Mass., has given his name to the establishment at which these goods were produced, and of which he is one of the chief proprietors, besides being the inventor of the machinery by which the goods are produced. The first loom which he invented for the manufacture of carpets is the one used by the Lowell Company, of Lowell, for the manufacture of three-ply and ingrain carpets, and which has revolutionized the carpet business in America. This loom produces twenty-five yards of carpets per day, and is managed by a girl with ease, while the hand-loom required a man to operate it and produced seven yards—while the quality of the goods woven by the power-loom was evener and better than those produced by hand. Mr. B. then invented the loom which he uses himself for the manufacture of Brussels carpets, and one for that of coach lace and trimmings, which are largely manufactured at the town of Clinton, in Worcester County, Mass., where the carpet manufactory is also situated. The first great step in the fabrication of all figured goods was made by Jacquard, who substituted an ingenious mechanism for the boy who formerly lifted, one by one, the threads of the warp, that the shuttle might pass through them to form the figure; for in all these goods the warp of the cloth, instead of being of a uniform color, is composed of many different ones, or by raising these in their proper order to the surface the pattern is formed so far as regards the warp. The weft was formerly regulated by the hand of the weaver, who, from a number of shuttles prepared with different colors of yarn, selected the one which he wanted, and after a few threads had been woven replaced it with another color. All this has been obviated by the invention of Mr. Bigelow, which consists of a most ingenious apparatus attached to the loom, and by which the shuttles are selected in their order, carried to their place, and put in operation without the loss of an instant, and by which the production of a loom daily has been nearly quadrupled, while it is attended by a young girl instead of a man, whose strength was required to perform the labor by hand. This relates to the loom for weaving the three-ply carpeting; but a very different apparatus was required for the production of the Brussels and the coach lace fabrics. In these the pattern is formed entirely by the warp of the goods, while the weft is only a strong thread to bind and secure the fabric together. The pile of the Brussels is formed by the insertion of wires in the process of weaving, over which the loop of the thread is formed; and these wires were formerly inserted by hand at every blow of the loom, and withdrawn after a short piece had been woven, to be used again. In the Bigelow loom this is done by the machine itself, for by the side of the cloth is placed a pair of pincers, which with every stroke of the loom advance, draw

out a wire from the portion already completed, retire and insert it in its place, in the portion of the warp when the next loop is to be formed, and repeat the operation with astonishing and unerring accuracy. The coach lace is formed in the same manner, and it is hard for the spectator to convince himself that the machine is not endowed with the spirit of vitality. These looms are being applied to various purposes, and the silk brocatelles exhibited from Connecticut are also their production.]

5. Smith, A. & J., *West Farms, New York.*—Patentees and Manufacturers.
Specimens of patent tapestry ingrain carpeting.

[This is an ingenious and novel mode of producing a very elegant and cheap two-ply, or ingrain carpet, by printing the warp or weft before weaving, so as to produce the figure in the cloth. The name of tapestry carpets is generally given to those in which the figure is produced in this way. It offers very great advantages in weaving, as the Jacquard motion is dispensed with, although the figure is not quite so perfect and clear as when it is produced in the loom.]

6. Higgins, A. & E. S., 15 *Murray Street, New York City.*—Manufacturers.
Power-loom Brussels and velvet tapestry carpets and rugs

7. Carhart & Nye, *Auburn, New York.*—Manufacturers.
Power-loom carpets.

[At the town of Thompsonville, Conn., there are manufactories of carpets which consume 10,000,000 lbs. of wool and 10,000 lbs. of flax yarn annually. The three-ply Brussels and Axminster carpets of the richest patterns are made here; power-looms have recently been introduced.]

8. Leon, Jarosson, *Jersey City, New Jersey.*—Manufacturer.
Specimens of painting on velvet, cloth, felt, and other fabrics, in imitation of the Gobelin tapestries, for table and piano covers and upholsterers' purposes.

9. Jewett, John, & Sons, 182 *Front Street, New York City.*—Manufacturers.
Specimens of floor cloths, printed in oil colors, upon prepared hemp canvas; "velvet-finish" floor cloths.

10. Aldrich, John H., 40 *Pine Street, New York City.*—Agent.
Rice's machine-printed oil cloths, for floors, &c.

[The canvas used in the manufacture of oil cloth is made partly of hemp and partly of flax, the former being the cheapest, but the latter retaining best the paint on the surface. In order to avoid seams, the canvas is made of great size on looms constructed for the purpose; it is frequently six or seven yards wide. A wash of wetted size is applied to each side, which is then rubbed down by pumice-stone to remove the irregularities of the canvas and give a proper surface for the oil and paint. The paints are the same as those used in house painting; mixed with linseed oil, but of thicker consistence, and with very little turpentine; many coats are applied on both sides. The printing was till recently done by blocks by hand, as in color-printing and paper-hanging printing; now it is executed in a great measure by machinery.]

11. Roberts, Peter, & Co., 375 *Broadway, New York City.*
Honiton and Brussels laces in great variety; Honiton point lace baptismal robe, chemisettes, coif, infant's cap; veils, collars, handkerchiefs, &c.

[Lace is made of fine threads of linen, cotton, or silk; it consists of a net-work of small meshes, the general form of which is hexagonal. The best laces are made at Mechlin, Brussels, Valenciennes, and Honiton. There are two kinds, *pillow lace*, made by hand, and *bobbin-net*, or machine-made lace. *Real*, or *pillow lace*, which is often very costly, is mostly made from flax-thread, on a *pillow* or cushion, by a very slow process, which cannot be fully described here—in general terms it may be said, a piece of stiff parchment, having the pattern sketched upon it, is fixed to the cushion by pins determined by the pattern; the threads, wound on small bobbins, are then twisted round each other in various ways, the bobbins serving as handles and stores of material, and the pins as centres round which the threads are twisted. *Brussels point lace* has the net-work made by the pillow and bobbins, and a pattern of sprigs worked with the needle. *Brussels ground* has a six-sided mesh, formed by twisting four flaxen threads to a perpendicular line of mesh. *Brussels wire-ground* is of silk; the meshes are partly straight and partly arched, and the pattern is worked separately by the needle. *Mechlin lace* has a six-sided mesh of three flax threads, twisted and plaited to a perpendicular line; the pattern being worked in the net. *Valenciennes* lace has a six-sided mesh formed of two threads, partly twisted and plaited; the pattern being worked in the net. *Lisle* lace has a diamond-shaped mesh, formed by two threads plaited to a perpendicular line. *Alençon* has a six-sided mesh of two threads; *Alençon* point is formed of two threads to a perpendicular line, with octagonal and square meshes alterately. *Honiton* lace is remarkable for the beauty of its figures worked by the needle. *Buckingham* lace, of a more common description, resembles the Alençon.

The hand-made lace, which formerly gave employment to great numbers of females in their own houses, has been superseded to a great extent by the *bobbin-net* lace, made first by hand-machines, as stockings are knit upon frames, but now by water and steam-power, applied to very ingenious and complicated machines. The products thus made are of a superior quality, as may be seen in the Nottingham laces in the English Department.

12. Waring, Susan G., *New Paltz Landing, New York.*—Manufacturer.
Lace handkerchief, embroidered in lace stitch. (For figure see Record, page 171.)

13. Tiltz & Dexter, 91 *William Street, New York City.*—Manufacturers.
Ladies' dress trimmings, in all varieties.

14. Mills & Carlock, *Bridgeport, Connecticut.*—Manufacturers.
Specimens of coach laces, tassels, and carriage trimmings.

15. Plimptons, Stephenson & Co., *Boston, Massachusetts.*—Proprietors.
Ribbons, fringes, bindings, cords, and other trimmings of silk and worsted.

16. Fischer, Henriette, *Columbus, Ohio.*—Manufacturer.
Worked lace handkerchief.

17. McCarthy, Elizabeth, 229 *East Twentieth Street, New York City.*—Manufacturer.
Silk bed-quilt.

18. Fitzgerald, Helen, *Mechanicsville, New York.*—Manufacturer.
Locomotive in raised worsted work.

19. Dubois, Mrs. M. D., —Manufacturer.
Silk velvet bed-quilt, composed of 5,312 pieces.

20. Hodgkins, G. A., *Lispenard Street, New York City.*—Manufacturer.
Picture wrought in worsted—"The Elopement."

21. Major, Mary Ann, 165 *Reade Street, New York City.*—Manufacturer.
"Espousal of the Prince of Wales to the Princess Catharine of France"—embroidered on worsted. The maker is fourteen years old.

22. Newstadt, Amelia, 436 *Broadway, New York City.*—Manufacturer.
Silk embroidery—"Washington on horseback."

23. Moody, Miss Bessie, *Bridgeport, Connecticut.*—Manufacturer.
Knitted quilt—crochet work.

24. Starkins, Miss Maria J., 284 *Fifth Street, New York City.*—Manufacturer.
Silk quilt, made of 6,500 octagonal pieces.

25. Ketcham, Miss Mary C., 127 *Chrystie Street, New York City.*—Manufacturer.
Bed-quilt ornamented with worked flowers in relief.

26. Gamble, Mrs. Julia, *Tallahassee, Florida.*—Manufacturer.
Silk and velvet quilt.

27. Coleman, Mrs. Mary Ann, *Frankfort, Kentucky.*—Manufacturer.
Three worsted, silk, and velvet quilts.

28. Williamson, Miss Frances H., 8 *Warren Street, New York City.*—Manufacturer.
Crochet work.

29. Smith, Mrs. Gilbert, 209 *Monroe Street, New York City.*—Manufacturer.
Silk bed quilt.

30. Anderson, Miss Ellen, *Louisville, Kentucky.*—Manufacturer.
The "Henry Clay quilt."

31. Warwick, Mrs., *Harlem, New York.*—Manufacturer.
Tapestry, marked in gold and silver.

32. Hammond, Mrs., *Albany, New York.*—Manufacturer.
Pictures worked in worsted—"The Descent from the Cross," and the "Last Supper," from Leonardo da Vinci.

33. Marshall, Mrs. S. H., *Belfast, Maine.*—Manufacturer.
Embroidered picture.

34. Mezette, Miss, *New York.*—Manufacturer.
Embroidery.

35. Pells, E. A., *New York.*—Manufacturer.
Embroidered picture.

36. Beyer, Caroline, *New York.*—Manufacturer.
Embroidery.

37. McBride, Mary A., *New York.*—Manufacturer.
Picture worked in worsted representing "Laban, Rebecca, and Jacob."

38. Carter, Virginia, J., *New York.*—Manufacturer.
Knitted quilt; crochet work.

39. Brown, Miss M., *New York City.*—Manufacturer.
Fancy needle work.

40. Purdy, Mary W., *Rye, New York.*—Manufacturer.
White cambric quilt, embroidered.

41. Canning, Mrs. Elizabeth W., *Jersey City, New Jersey.*—Manufacturer.
Fancy bed-quilt, ornamented with designs of birds, fruits, and flowers, in colored cotton cloth.

42. Morgan, Misses Abby & Sarah, 427 *Hudson Street, New York City.*—Manufacturers.
Embroidered bed-quilt.

43. Slote, Miss Orriana, 451 *Tenth Street, New York City.*—Manufacturer.
Silk and worsted embroidery—"The Last Supper." The maker is only thirteen years old.

44. Combes, Mrs. S. M., *Hampden, New York.*—Manufacturer.
Flannel embroidered hearth-rug.

45. Hogeboom, Mrs. Helen, *Castletown, New York.*—Designer and Manufacturer.
Embroidered broadcloth table cover, from original designs, and worked without a pattern.

46. Wilcox, Mrs. John, 64½ *Sullivan Street, New York City.*—Manufacturer.
Worsted embroidery—"Convention of great artists in the Vatican."

47. Jillson, Rebecca S., *New London, Connecticut.*—Manufacturer.
Embroidered picture of the Abbotsford family.

48. Lossin, Martha, *Talladega, Alabama.*—Manufacturer.
Broadcloth centre-table cover, embroidered, in silk, worsted, and velvet.

49. Kaiser, Mrs. Maria, *New Orleans, Louisiana.*—Manufacturer.
Embroidered picture in worsted.

50. Wason, Mrs. Milton, *Somerville, Massachusetts.*—Proprietor.
Two pieces of embroidery.

51. Knight, Abram, *Yonkers, New York.*—Proprietor.
Worsted embroidery—Interior of monastery, and figures.

52. Herbst, Mary, L. J., 110 *Forsyth Street, New York City.*—Manufacturer.
Embroidery in gold and silver thread.

53. Hesser, Madame, V. J. Z., 421 *Sixth Avenue, New York City.*—Manufacturer.
Knitted bed-quilts; crochet work; pianoforte cover.

54. Wilson, Peter, *Versailles, New York.*—Proprietor.
Table cover, lamp mat, needle cushion, satchel, game bag—all specimens of Indian embroidery with variously-colored glass beads.

55. Marcet, Julia J., 94 *Orchard Street, New York City.*—Manufacturer.
Wreath of flowers, embroidered in colored silks, on a white ground.

56. Vogel, George F., 388 *Hudson Street, New York City.*—Manufacturer.
Specimens of regalia, lap decorations, embroidered suspenders, and other articles.

57. Clark, Mrs. J. P., *Detroit, Michigan.*—Manufacturer.
Embroidery—"King David playing on a golden harp.'

58. Osborn, James, *Williamsburg, New York.*—Proprietor.
Embroidery.

59. McKenzie, Margaret, —Manufacturer.
Worsted embroidery—"The Finding of Moses."

60. Hunter, Mrs. S. C., *Gales County, North Carolina.*—Manufacturer.
Crochet bed-quilt.

61. Short, Miss Eliza A., *Brunswick, Virginia.*—Manufacturer
Quilt made of a great many pieces of differently colored silks.

62. Disbrow, Harriet, —Manufacturer.
Crochet quilt. The maker is only eight years old.

63. Dey, Lavinia, A., —Manufacturer.
Embroidered worsted pictures—"Descent from the Cross," "Last Supper," of Leonardo da Vinci.

[What is called "Berlin work" has greatly increased both in Europe and America during the last forty years; the kind of work is very old, but the beauty and perfection of the patterns is a new thing. In 1810, Madame Wittich, of Berlin, a lady of great taste and an accomplished needlewoman, seeing the advantages which would result to her favorite art from the production of superior patterns, persuaded her husband, a noted print-seller, to publish a series of designs; these were executed in so superior a manner that many of the first patterns issued are still in great demand. The patterns are now multiplied to an immense extent, with every variety of device and shade of color. To such an extent does the mania for this kind of work prevail, that there is hardly an article of parlor furniture which is not ornamented, and in many cases disfigured, by the efforts of the Berlin wool workers. The passion seems to have seized all ages and both sexes; and one's eyes are daily met with these productions of the fingers of aged and younger matrons, damsels, infant phenomena, and masculine embroiderers.]

GREAT BRITAIN AND IRELAND.

64. Tempieton, James, & Co., *Glasgow, Scotland.*—Manufacturers.
Axminster carpets. For figure see Record, page 167.)

[The Axminster carpet seems to have been commenced in imitation of the Turkey carpet; they are noted for their thick and soft pile; the worsted being thrown entirely to the surface, instead of appearing on both sides, the material is economized and the surface is smoother. These carpets are generally made in one piece, according to the dimensions of the room for which they are intended. The warp is of strong linen placed perpendicularly between two rollers, which turn round, and enable the chain to be changed from one to the other as the weaving proceeds. Small tufts of differently colored worsted are fastened under the warp; when one row of these tufts has been completed, the shoot of linen is also thrown in and firmly rammed down; another row of tufts is then arranged, and so on till the pattern is finished; a small paper drawing hangs before the workman for a guide. Real Turkey carpets are made in a similar manner. The rugs are made by a slightly modified apparatus.]

65. Henderson & Widnell, *Lasswade, near Edinburgh, Scotland.*—Manufacturers.
Tapestry carpets; velvet portiere.

[Patent tapestry carpeting has been brought to great perfection within the last five years, and now gives employment to nearly 1,000 looms. The peculiarity of the manufacture is the unlimited number of shades of colors that can be introduced, so that the most elaborate pictures can be executed; the saving of worsted is also an important item. The appearance is that of Brussels carpet, but the manufacture is more simple, each thread being colored separately, at spaces, with the requisite shades. The process is simple and ingenious, but much care is necessary in arranging the threads and putting them on the beam. The invention was patented about twenty years ago.]

66. Henderson & Co., *Durham.*—Manufacturer.
Wilton, or pile carpets; Brussels and Venetian carpets.

67. Grundy, J. & E., *Manchester, England.*—Manufacturers.
A variety of druggets and floor cloths.

68. Lewis, William & Thomas, 452 *Pearl Street, New York City.*—Importers.
Velvet pile carpets and rugs; sheep and Angora goatskin rugs and mats.

69. Thompson, David, *Dundee, Scotland.*—Manufacturer.
Carpeting and matting.

70. Bevington & Morris, 67 *King William Street, London.*—Manufacturers.
Cocoa-nut fibre matting and mats.

[The cocoa-palm, a native of most tropical countries, is perhaps the most useful of all trees to uncivilized man; and even civilized man has been constrained to make use of it, and to admit that it is possible to build vessels, fit them for sea, and freight them with valuable cargoes exclusively from the products of the cocoa-palm. To speak only of the uses here suggested—the natives of India have long been in the habit of using the rotted fibres of the outer husk of the cocoa-nut; they are spun into yarn, called *coir*, which is largely imported for weaving-cloths, covering passages and rooms, and for mats. There are three descriptions of fibre, used for different purposes: a light, elastic fibre, used for stuffing furniture; a coarser fibre, for making mats; and a third fibre, used for brushes and brooms. After soaking in water, the fibres are subjected to the pressure of grooved rollers, and then carded and combed for the purposes above mentioned.]

71. McDonald, D. & J., & Co., *Glasgow, Scotland.*—Manufacturers.
Specimens of embroidered muslin and cambric, embroidered trimmings, insertions, &c.; collars, chemisettes, sleeves, handkerchiefs, &c.

72. Saxton, Alfred, *Hollow Stone, Nottingham, England.*—Manufacturer.
Cotton lace, netting, and embroideries; shawls, &c.

73. Holden, John, & Co., *Belfast, Ireland.*—Manufacturers.
Sewed book-muslin collars, capes, caps, frock bodies, &c.

74. Sisters of Mercy, *Kinsale, County Cork, Ireland.*—Manufacturers.
Vestments, embroidery, flowers in lace, &c.

75. Barnet, L. C., & Son, *Nottingham, England.*—Manufacturers.
Patterns of machine-wrought black silk and blonde laces; Genevese, Maltese, Honiton, &c.; needle-wrought laces.

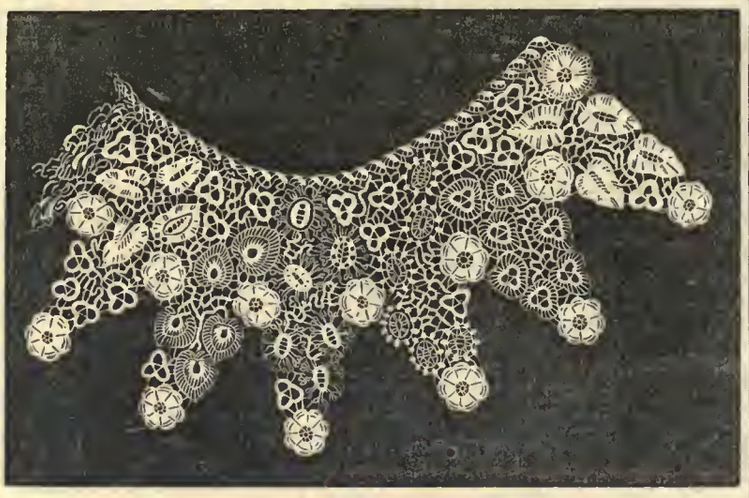
[The machine lace of Nottingham is famous for its delicacy and beauty. The bobbin-net machine was invented in 1809, and in 1823 its use was quite general; the powers of production of the lace-machine are to hand-labor nearly as 30,000 to 5, and the lace produced by it has, for common articles, entirely superseded real lace. In the bobbin-net machine, one set of threads is stretched in parallel lines up and down the machine; another set is wound round small bobbins; the meshes of the net-work are produced by these bobbins twisting in and around and among the vertical threads—after being woven, the net is singed to remove the little hairy filaments; embroidered, if of the better kind; mended, if torn; bleached; dyed, if a black lace; dressed or stiffened with gum; and finally rolled and pressed. The ordinary material of bobbin-net is two cotton yarns, of from No. 180 to No. 250, twisted into one thread. The beauty of the fabric depends on the quality of the material, as well as the regularity and smallness of the

meshes—the number of warp threads in a yard is from 600 to 900, or from 20 to 30 in an inch; the breadth of the product varies from edging of a quarter of an inch to webs five yards wide.

76. Lyde, Watcham, & Co., 121 *Wood Street, Cheapside, London.*—Manufacturers.
Fancy lace and muslins; ladies' and infants' dresses; chemisettes, handkerchiefs, &c., in rich and varied patterns.

77. Manly, Mrs., *Blackrock, Cork, Ireland.*—Manufacturer.
Specimens of crochet pearl tatting and guipure lace; design—rose, shamrock, and thistle; collars, berthes, chemisettes, sleeves, and coiffures of same material.

[Crochet lace is remarkable for durability, delicacy, and elegance of design, qualities which have caused it to take the place to a considerable extent of the Honiton, Valenciennes, and Brussels laces. It can also be produced at a much lower price than the above laces, on account of the cheapness of labor in Ireland. These articles display great skill in workmanship and beauty of design.]



Mrs. Manly.—Crochet Work.

78. Jaffray, J. R., *Broadway, New York City.*—Importer.
Honiton lace flounce, valued at $1,000.

[The district in which Honiton lace is made is about thirty miles along the coast of Devonshire, and about twelve miles inland; about 8,000 persons are employed in its manufacture. It is made on the pillow by hand labor; it was confined at first simply to sprigs and borders, but now the most elaborate and costly articles are made. Honiton lace veils have frequently been sold for 500 or 600 dollars; and a flounce is exhibited in the English Department valued at $1,000. Honiton differs from "pillow" or "thread" lace, in having the pattern made separately, and afterwards sewn on to a machine-made net.]

79. Rolph, Jonas, *Stony Street, Nottingham, England.*—Manufacturer.
Imitation Brussels point lace, veils, sleeves, &c.

[British point, tambour, and Limerick laces are similar in their mode of manufacture, being hand-made; they embrace the imitations of Honiton and Brussels lace, and are made into a great variety of elegant and useful articles, as the exhibition fully proves. "British point" is made chiefly in the neighborhood of London; "tambour" is made extensively in Nottingham; the Limerick lace is peculiar to Ireland.]

80. Higgins, John, & Co., *Dublin, Ireland.*—Manufacturers.
Irish embroidered muslins and lace; a rich and extensive assortment of ladies' and infants' dresses; chemisettes, sleeves, handkerchiefs, &c. (For figures, see the Record, pages 66, 67.)

[Since the destruction of the linen-yarn spinning by hand, by the introduction of machinery, the attention of the Irish and Scotch peasantry has been turned to the manufacture of embroidery; and, since the multiplication of patterns has become so easy and so cheap by the substitution of lithography for block-printing, about the year 1830, this branch of female industry has made very rapid progress. In the West of Ireland this trade forms the principal support of the female population; it has extended itself over half the counties of Ireland, and gives employment to at least 250,000 females—the amount of wages will vary from one to ten shillings a week, according to the skill of the worker. At least £600,000 are annually distributed in wages to workers mostly in their own houses.]

81. Forrest, James, & Sons, 101 *Grafton Street, Dublin, Ireland.*—Manufacturers.
Lace royal sash guipure; Limerick lace dresses, flounces, &c.

[Among the various contributions from Ireland made to the Crystal Palace, one of the most prominent is the Limerick lace. This manufacture was commenced about twenty-five years ago, since which time it has been gradually increasing in extent and celebrity. Messrs. Forrest introduced the guipure style about two years since; it has been so much admired as to be patronized by Queen Victoria, and it is now termed the Royal Irish guipure, having been worn by her Majesty on many public occasions.

It is made by cutting out the pattern from cambric, the flowers and heavy parts being made of the cambric, and the open parts of stitches olosely resembling the antique lace. In many cases the eyelet holes form the groundwork of the lace, which renders it tedious and difficult to make; notwithstanding the inequalities of its texture, it is very durable, and equally beautiful, without being as expensive, as the antique lace.

The specimens exhibited by them consist of a beautifully worked set of flouncing; a very handsome polka jacket; some exquisite designs in berthes, sleeves, collars, headdresses, and handkerchiefs; also fine shawls of Limerick lace, the patterns of which are worked upon a foundation of net; and long scarfs of the same description of lace, of new and various patterns. There is a specimen of appliqué lace, so called from the patterns being cut out and sewn on a foundation of net; by this means the same patterns may be transferred from a veil to a scarf or lappet, and they will wear out several foundations. A dress of Irish blonde should also be mentioned, which, though embroidered in gold, is of a light, elegant, and chaste appearance; this style of work has been lately introduced, but will soon be extensively sought after.

Some idea may be formed of the extent of this manufacture, from the fact of its giving employment in Limerick to between 2,000 and 3,000 females. Messrs. Forrest employ about 800 in their Abbey Court Factory alone.]

John Higgins & Co.—Irish Embroidery.

82. Adams, Miss Jane, *Strabane, Ireland*—Manufacturer.
Lace scarf of fine unbleached linen thread, containing nearly three and a half millions of stitches, and over twelve miles of thread, and weighing only five and three-quarter ounces; collars, cuffs, and handkerchief.

83. Industrial Poor School of Ursuline Convent, *Blackrock, near Cork, Ireland.*—Manufacturers.
Crochet work; embroidery; rich lace dresses, collars, scarfs.

81. Stewart, A. T., & Co., *Broadway, New York City.*—Importers.
Rich specimen of Honiton and other lace goods.

85. Lambert & Bury, *Limerick, Ireland.*—Manufacturers.
Limerick lace; flounce, shawl, &c.

86. Long, George, *Loudwater, Bucks, England.*—Inventor and Manufacturer.
Pillow lace; ladies' bonnet materials of horse hair. (For figure, see Record, page 142.)

87. Austin, James, 8 & 9 *Princes Street, London.*—Manufacturer.
Patent sash, blind, lamp, and picture lines.

88. Amies, Broadbent, & Co., *Manchester, England.*—Manufacturers.
Mohair, alpacca, and other braids.

89. Harding, William, & Co., 68 *Long Acre, London.*—Manufacturers.
Specimens of coach lace and trimmings.

90. Worrell, Miss Caroline A., *Bath, England.*—Designer.
Worked Berlin-wool reading cushion.

91. Ditl, Madame, 23 *Charlotte Street, Dublin.*—Manufacturer.
Silk embroidered screen.

92. Ward, Mrs. Anne, *Coleraine, Ireland.*—Designer and Manufacturer.
East view of Giant's Causeway, in needlework.

93. Clancarthy, Countess of, & Butler, Lady Anne, *Garhalby, Ballinasloe, Ireland*—Manufacturers.
Doileys, edged, and embroidered with views in Ireland.

94. Hayward, John, & Co., 35 *St. Martin's Lane, London*—Manufacturers.
Richly embroidered vest patterns.

95. Cleary, Miss Margaret, *Clonmel, Ireland.*—Manufacturer.
Berlin wool work—"Last Supper;" "Robert Burns at the Plough;" "The Blind Girl at the Well."

96. Belshaw, Maria Louisa, *Brooklyn, New York.*—Manufacturer.
Embroidered portrait of Washington, in worsted and silk; embroidered picture of Queen Esther before Ahasuerus.

[These works were executed by the exhibitor in Dublin.]

97. Williams, Mrs. James, 4 *Homeville, Dublin.*—Manufacturer.
Berlin wool tapestry picture of Queen Victoria.

98. Neville, M. Marian, *Dublin.*—Manufacturer.
"A Lecture on Housekeeping," in needlework—table scenes.

BRITISH COLONIES.—CANADA.

99. McGrath, James, *Quebec, Canada.*—Proprietor.
A large embroidered Berlin wool carpet, worked by the ladies of Toronto for the benefit of St. George's Church.

100. Geddes, Rev. J. G., *Hamilton, Canada West.*—Proprietor.
A large embroidered Berlin wool carpet, worked by the ladies of Hamilton for the benefit of their church, valued at $800.

101. Tetu, J., *Berthier, Canada East.*—Manufacturer.
Thread lace collars and ornaments, and priest's white knitted surplice.

102. Thompson, Miss Kate, *Toronto, Canada West.*—Manufacturer.
A rose point lace collar.

103. Jobin, Madame J. B., *Quebec.*—Manufacturer.
A knitted table cover of unbleached linen.

104. Bouchard, Madame J. B., *St. Valière, Canada East.*—Manufacturer.
A knitted counterpane; set of knitted bleached linen curtains, and lace caps.

105. Martel, Miss P., *St. Ambroise, Canada East.*—Manufacturer.
Knitted table covers, and lace caps and collars.

106. Neilson, Miss, *Quebec.*—Manufacturer.
A patch-work silk cushion.

107. Dutton, Miss Eliza, *Montreal, Canada East.*—Manufacturer.
A knitted cradle quilt.

108. Reed, Mrs. John, *Brockville, Canada West.*—Manufacturer.
A knitted quilt.

109. Globrusky, Miss, *Lachine, Canada East.*—Manufacturer.
A complete set of embroidered furniture, consisting of seats and backs for ottoman, arm-chair, French chair, footstool, piano stool, and six chairs.

FRANCE.

110. Imperial Manufactory of the Gobelins, *Paris.*—Manufacturers.
Five pieces of tapestry.

[The pieces of Gobelins tapestry represent:
"Autumn," after Lancret; executed in 1849, by M. Maloisel; valued at 14,000 francs. "The Wolf and the Lamb," after Desporte; executed in 1842, by M. Thiera; and "The Hound and her Companion," also after Desporte; executed in 1842, by M. Prevotet; 8,500 francs. "Subject taken from the Chase and Still Life," after Desporte; executed by M. Hypolite Lucas; 20,000 francs.

Two seats and backs of chairs in carpet work; executed by M. M. Renard and Geuthier, from designs by M. Godefroy; 2,500 francs.

This magnificent establishment is conducted by the French government. It was bought from the Gobelin family in 1677, by Colbert, who there established a manufactory of tapestry similar to that of Flanders.] (For a historical and descriptive account of this manufactory see the Record, page 136.)

111. Imperial Manufactory of Beauvais, *Beauvais (Oise).*—Manufacturers.
Seven pieces of tapestry.

[The tapestry from the Manufactory of Beauvais represents:
"Combat of the Two Goats," after Aubrey, by Chevalier; valued at 4,000 francs. "The Skaters," after Lancret, by Chevalier; 6,000 francs. Landscape, after Desgoffes, by Auguste Melisse; 8,000 francs. Three Leaves for a Screen, after Aubrey, by Chevalier; 20,000 francs. "The Reading Lesson," after Bonchet, by Chevalier; 2,500 francs.

The carpet manufactory of Beauvais was founded by Colbert in 1664. Some of the surplus carpets are sold. The manufactory is still carried on by the French government.]

112. Requillart, Roussell, & Chocquel, *Tourcoing, Nord, and Rue Vivienne, Paris.*—Manufacturers.
Carpets and tapestry; coarse and fine moquette, curtain and panel.

113. Lecun & Co., *Nimes, Gard.*—Manufacturers.
Specimens of carpets, rugs, foot mats, and table covers.

114. Ringuet, *Paris.*—Manufacturer.
Carpets and tapestry.

115. Braquenié, Alex., *Rue Vivienne, Paris.*—Patentee and Manufacturer.
Piled velvet carpets, d'Aubusson; Aubusson carpet, without reversed side.

116. Milot, M., *Rue St. Honoré, Paris.*—Manufacturer.
Delicate embroideries in gold and silver.

117. Chancerel, Madame, *Schamberg, Vosges.*—Manufacturer.
Samples of improved embroideries.

118. Gantillov, C. E., 2 *Rue des Capucins, Lyons.*—Manufacturer.
Two portraits of Napoleon I., embroidered in satin.

119. Joyeaux, Emile, *St. Lazare, Paris.*—Manufacturer.
Crochet tissues.

120. Sallandrouze de Lamornaix, *Paris.*—Manufacturer.
Fine Aubusson carpets and tapestry. (For a figure see the Record, page 142.)

[The Aubusson carpets are made on the same principle as tapestry and Turkey carpets; they are consequently very expensive; they are second only to those of the Gobelins and Beauvais. In the department of the Creuze, in which Aubusson is situated, at least 5,000 persons are employed in the manufacture of carpets and tapestry.]

121. Lefebvre, Aug., *Bayeux Calvados*, and 42 *Rue de Cléry, Paris.*—Manufacturer.
Thread lace counterpane; lace shawls, scarfs, flounces, collars, coiffures, blonde mantels, &c.

[The principal towns of France noted for the manufacture of machine lace are Calais, Lille, St. Quentin, Lyons, and Cambray. It was introduced into Calais by Englishmen from Nottingham about 1817. Malines and Valenciennes lace are extensively imitated; at Lyons and Cambray great quantities of silk net and black lace are made in imitation of the beautiful hand-made fabrics of Caen and Chantilly, at 75 per cent. less cost. The manufacture of hand lace in France gives employment to more than 200,000 females. At Caen and Bayeux, in the department of Calvados, about 40,000 persons are employed in the manufacture of black lace piece goods of the finest quality and most elegant designs. The Chantilly laces are finer and richer, and can only be obtained by the wealthy. The Lille lace is white thread lace, called *clear foundation;* it is the lightest, finest, and most transparent of this kind of lace. In the department of the Vosges is made a lace called "guipure," very much resembling the Honiton; it is very fine and white, and of

moderate price. Alençon lace requires from fourteen to sixteen workers for the smallest size and the simplest pattern; it is the only lace made with pure hand-spun linen thread, which is worth 500 or 600 dollars a pound—this is the richest, finest, strongest, and most expensive lace.]

122. Lalaux, Brin, *Hombliéres, near St. Quentin.*—Manufacturer.
Embroidered gauze tissues for robes, curtains, &c

123. Curtis, L. and B., & Co., *New York City.*—Importers.
A variety of French laces.

124. Stewart, A. T., & Co., *New York City.*—Importers.
French lace fabrics.

125. Guillemot, Brothers, *Meulan*, and *Rue Neuve des Mathurins, Paris.*—Manufacturers.
A variety of coach and livery laces.

126. Morgat, *Rue de Rivoli, Paris.*—Manufacturer.
Samples of tapestry for chairs, footstools, fauteuils; and rich embroideries in various styles.

127. Colondre, M., *Rue Bourbon Villeneuve, Paris.*—Manufacturer.
A variety of new fabrics for vests.

128. Mourieau, J. C., *Paris.*—Manufacturer.
Materials for furniture covers.

129. Griuntgens, *Rue St. Denis, Paris.*——Manufacturer.
A rich assortment of fancy articles made in chenille, and chenille trimming materials.

THE GERMAN STATES.

130. Heinig, J. G., & Co., *Meerane, Saxony.*—Manufacturers.
Sofa carpet; carpet bags for ladies and gentlemen.

131. Woerlen, Aug., *Nordlingen, Wurtemberg.*—Manufacturer.
Carpets and table covers.

132. Forguignon, J., *Bremen.*—Manufacturer.
Carpet.

133. Mueller, J. H., *Bremen.*—Manufacturer.
Rugs and mats.

134. Voz, Emilie de, *Apenrade, Schleswig.*—Manufacturer.
Berlin wool carpet, worked by hand.

135. Quast, F., *Leipsic, Saxony.*—Manufacturer.
Oil cloth; oiled fustians; double oiled floor cloths, &c.
[This branch of Saxon industry has Leipsic for its centre.]

136. Burchardt, B., & Sons, *Berlin, Prussia.*—Manufacturers.
Printed oil cloths, table covers, and double floor cloths; transparent blinds, hat linings, and carriage oil cloths.

137. Grund, I., *Buchholz, Saxony.*—Manufacturer.
Embroidered bonnets and trimmings.

138. Eismann, I. A., *Annaberg, Saxony.*—Manufacturer.
Embroideries and trimmings.

139. Worlin, Carl, *Memmingen, Wurtemberg.*—Manufacturer.
Fur rug of 650 pieces.

140. Pohl, Hermann, *Schneeberg, Saxony.*—Manufacturer.
Cotton and silk laces and embroidery; caps, skirts, chemisettes, collars, &c.

141. Stecher, A. J., *Klingenthal, Baden.*—Manufacturer.
Tambour embroidered chemisettes and collars; other specimens of embroidery.

142. Foerster, F., *Eibenstock, Saxony.*—Manufacturer.
An extensive variety of silk, thread, bobbin, Brussels, and woollen laces; muslin and lace embroideries, trimmings, collars, handkerchiefs; black lace mantillas, &c.

143. Neidel, J. G. (Heirs), *Nuremberg, Bavaria.*—Manufacturer.
Imitation gold and silver lace.

144. Danckwardt, H. D., & Co., *Schneeberg, Saxony.*—Manufacturers.
Silk lace and blondes; chemisettes, collars, dresses, trimmings.

145. Uhlmann, C. F., *Bremen.*—Manufacturer.
Lace fabrics; caps, handkerchiefs, collars, sleeves, chemisettes, black lace mantillas, skirts, &c.

146. Siebel, C. W., & Brinck, *Elbertfeld, Prussia.*—Manufacturers.
A variety of silk braidings and trimmings.

147. Helweg, Hans, *Buchholz, Saxony.*—Manufacturer.
White, sewing, and ball fringes, gimps, laces, &c.
[The fringe manufacture of Saxony is principally centralized in Annaberg and Buchholz; thousands of looms are used in the processes, which employ great numbers of persons.

147a. Grund, I., *Buchholz, Saxony.*—Manufacturer.
Embroidered ladies' bonnets, &c.

148. Schaerff, Robert, *Brieg, Prussian Silesia.*—Manufacturer.
Silk and worsted borders, tassels, and gimps for carriages and saddlery trimmings; bridles, gun ribbons, and girths.

149. Eisenstuck & Co., *Annaberg, Saxony.*—Manufacturer.
Silk trimmings, laces, fringes, and blonde.

150. Arnold, Frederic, *Offenbach-on-the-Maine.*—Manufacturer.
Silk and woollen carriage trimmings.

151. Caspar, Henderkott, & Sons, *Barmen, Prussia.*—Manufacturers.
Carriage trimmings, &c.

152. Lautner, Lewis, *Scheibenberg, Saxony.*—Manufacturer.
Curtain fringes.

153. Schmidt & Mueller, *Plauen, Saxony.*—Manufacturers.
Embroideries on jaconet and cambric.
[The manufacture of cotton, woollen, and silk-mixed damasks and embroidered articles, has its seat in that part of Saxony called the Voigtland, the centre of which is Plauen. The goods are woven by hand on Jacquard and embroidering looms in the weavers' houses; the embroidered goods are principally made by girls. In Chemnitz and its neighborhood there are more than 2,000 Jacquard looms, mostly belonging to the weavers. This branch of industry is in a very flourishing condition.]

154. Kietel, F. Albert, *Leipsic, Saxony.*—Manufacturer.
Embroideries on white satin, in imitation of engravings and water-color drawings; embroidered tableau; pictures in raised work; embroidered cloths.

155. Kaul, Matilda, *Breslau, Prussia.*—Manufacturer.
Crochet and knitted articles.

156. Rode, Louise, *Loewenburg, Prussia.*—Designer and Manufacturer.
Crochet work and embroideries.

157. Ficher, Bernhard, Jr., *Annaberg, Saxony.*—Manufacturer.
Crochet table cover, silk on velvet; silk and cotton fringes and trimmings.

157a. Eismann, I. A., *Annaberg, Saxony.*—Manufacturer.
Embroideries and trimmings.

158. Boehler, F. L., & Son, *Plauen, Saxony.*—Manufacturers. Agent: H. Ackermann, 79 *Cedar Street, New York City.*
White cotton fabrics and embroideries; curtain brocades; handkerchiefs, trimmings, dresses, etc.

159. Marquardt, Louise, *Stargardt, Prussia.*—Manufacturer.
Berlin wool and crochet shawl.

160. Schuster, *Nuremberg, Bavaria.*—Manufacturer.
Gold and silver embroideries.

161. Neuburger, H., & Sons, *Stuttgardt, Wurtemberg.*—Manufacturers.
A variety of embroideries and muslins.

162. Meinhold & Neitzsche, *Plauen, Saxony*—Manufacturers.
Cambric curtain embroideries, &c.

163. Brasch, Miss C., *Bremen.*—Manufacturer.
Fine embroideries.

164. Paulson, Charlotte, *Hamburg.*—Manufacturer.
Embroidered cushion, in Berlin wool.

THE AUSTRIAN EMPIRE.

165. Maurer, V., *Iglau, Moravia.*—Manufacturer.
Samples of rugs and horse-cloths.

166. Rulke, *Vienna.*—Manufacturer.
Military trimmings, galleons, &c.

167. Prohaska, W., *Prague, Bohemia.*—Manufacturer.
Two mosaic and embroidered table covers.

168. Roetz, J., *Graslitz, Bohemia.*—Manufacturer.
Embroidered scarf, cambric handkerchief, and chemisettes.

[Cheap net is made in Bohemia and in Vienna, and veils at Milan; it is made by machinery chiefly, the introduction of which has reduced the number of workers from 80,000 to 12,000.

THE ITALIAN STATES.

169. Rey, Brothers, *Turin, Sardinia.*—Manufacturers.
Curtain tapestry damasks of various colors, in cotton and wool.

170. Comparato, Maria, *Savona, Sardinia.*—Manufacturer.
Various specimens of lace.

171. Tessada, Francesco, *Genoa, Sardinia.*—Manufacturer.
Embroidered cambric handkerchiefs; mantillas and scarfs of various qualities.

172. Descalzi, Giulia Solari, *Genoa, Sardinia.*—Manufacturer.
Two napkins of pure linen, richly worked by hand.

173. Tedeschi, Maddalena, *Genoa, Sardinia.*—Manufacturer.
Various specimens of embroidery.

174. Pavesio, Madame C., *Turin, Sardinia.*—Manufacturer.
Plumes and feather ornaments of all colors and descriptions.

SWITZERLAND.

175. Bourry d'Ivernois, *St. Gall, Canton St. Gall.*—Manufacturer, and 70 *Broadway, New York City.*
Embroidered lace curtains and fine muslins.

176. Pauly & Co., *St. Gall, Canton St. Gall.*—Manufacturers.
Linen cambric handkerchiefs, embroidered in crochet and "au passé;" baptismal robe for infants, of muslin, embroidered in crochet; embroidered tulle.

177. Heumann's, J. B., Successor, *St. Gall.*—Manufacturer.
Blinds embroidered in tulle; organdie muslins embroidered.

178. Cuendet, Adeline, *Geneva.*—Manufacturer.
Point lace and bridal veils, handkerchiefs, head-dresses, and collars.

179. Bridgemann & Gouzenbach, *St. Gall.*—Manufacturers.
Embroidered tulle and muslin christening robes; flounced dresses and sacks, linen cambric collars, handkerchiefs, &c.

180. Meyer, J. J., Jr., *St. Gall.*—Manufacturer.
Richly embroidered muslins and jaconets.

181. Schlaepfer, Schlatter, & Kuersteiner, *St. Gall.*—Manufacturers.
A great variety of embroidered muslins.

182. Staheli-Wild, Caspar, *St. Gall.*—Manufacturer.
Embroidered table cover; embroidered lace dress; lace mantilla; cambric handkerchiefs and collars.

183. Koelreutter, Félix, *St. Gall.*—Manufacturer. Agents: Bourry d'Ivernois, *New York City.*
Embroidered cambric handkerchiefs and collars.

184. Gerstlé, Henry, & Co., *St. Gall.*—Manufacturers.
Sample of embroidery.

185. Brunner, Jacob J., *St. Gall.*—Manufacturer.
Various embroideries, curtains, handerchiefs, capes, &c.

186. Sutter, J. J., *St. Gall.*—Manufacturer.
Various specimens of silk embroidery; handkerchief, richly embroidered in black silk (valued at $160).

[The embroidery of muslin gives employment to at least 40,000 persons; the finest goods are made in Appenzell, the cheaper articles are made chiefly in St. Gall. At least 100,000 pairs of curtains are annually exported to Great Britain alone.]

187. Ernenpeutsch, J. C., *St. Gall.*—Manufacturer.
Specimens of embroidery.

BELGIUM.

188. Bergé, V., *Tournay.*—Manufacturer.
Tapestry carpetings.

[Tournay is noted for its fine carpets.]

189. Berenhart, A., & Co., *Antwerp.*—Manufacturers. Agents: Lewis Ritz & Co., *New York City.*
Embroidered lace flounce, scarf, berthe, &c.

190. Genicot de Man, *Antwerp.*—Manufacturer.
Lace fabrics, collars, trimmings, &c.

191. Dufrenne, Sophie, *Brussels.*—Manufacturer. Agents: Bourry d'Ivernois & Co., *New York City.*
Brussels lace fabrics, handkerchiefs, collars, &c.

[Belgium gives employment to at least 100,000 persons in the manufacture of its peculiar laces. The laces principally manufactured are the Brussels, Mechlin, Valenciennes, and Grammont. Brussels lace, before the manufacture of machine-made lace, was of the most beautiful description, but so costly as to be within the means of but few; now the flowers are made by hand, and sewn on to the machine-made net in Nottingham, England. Its resemblance to the true Brussels lace is so striking as often to deceive those who have a good knowledge of lace. With the exception of the Alençon lace, Brussels produces the most valuable lace known.

Mechlin laces are made at Malines, Antwerp, and in the vicinity, and are very light and beautiful. Their peculiarity consists in a plait thread surrounding the flowers, thus designing the outline and giving the appearance of embroidery. This lace has suffered much from the caprice of fashion.

Valenciennes laces are chiefly made in Yprès, Menin, Bruges, Ghent, and the surrounding villages. Yprès lace is of the finest and most expensive kind; about 20,000 workers are employed in its vicinity. Menin affords employment to about 3,000 workers; Bruges lace is much sought after for trimmings; Ghent employs about 12,000 persons. Grammont is famous for its white thread lace and its black point trimming lace; and for shawls, scarfs, berthes, &c., which, though inferior to those of French manufacture, are furnished at more moderate prices.]

192. Everlart, Julie, *Brussels.*—Manufacturer.
Lace fabrics.

193. Bongaerts, F., *Antwerp.*—Manufacturer.
Carpets of cow's hair.

THE NETHERLANDS.

194. Prins, L. J., (Widow of), *Arnheim.*—Manufacturer
Carpets and rugs, manufactured of cow's hair.

195. Van Heynsbergen, W. J., *The Hague.*—Manufacturer.
Military ornaments, epaulettes, sword and shoulder knots, cords, scarfs, &c.; galloon, and gold and silver thread.

196. Willink, Warner, Heirs of, *Amsterdam.*—Manufacturers.
Woollen velvet, called Velours d'Utrecht, for tapestry and furniture coverings.

197. Noordwyns, N. J., *Rotterdam.*—Manufacturer.
Knitted table cloth.

SECTION III. CLASS XX.

ARTICLES OF CLOTHING FOR PERSONAL OR DOMESTIC USE.

This class contains a very great variety of articles, of which the majority have been made familiar by the requirements of daily life. The curious reader and observer will not fail to notice the differences of wealth, taste, and civilization, so well represented by the contributions of the various countries. These contrasts are less striking in respect to our own country and the western nations of Europe than among uncivilized and Oriental people; but they are sufficiently marked to render the study of the examples under this class a highly entertaining and useful exercise.

The present class shows the last stage of manufacture. Nearly all the fabrics and raw materials, as well as machines, noticed in the preceding classes, are more or less concerned in furnishing or completing the articles of dress.

Several subsections of this multifarious class suggest themselves—hats, caps, and bonnets; hosiery—cotton, woollen, and silk; gloves—leather and woven; boots, shoes, etc.; under clothing; upper clothing. The first and fourth of these divisions are manufactures of special importance in the United States. About 11,700,000 hats and caps, valued at $15,020,000, are annually manufactured in the United States, employing 24,000 persons. One and one-half million straw hats are also consumed each year, of which one-half are imported. The manufacture of boots and shoes is principally carried on in New England; in the absence of any census returns of manufactures, no statistics can be given.

Great Britain and her possessions exhibit a variety of the famous Nottingham hosiery, shoes, and straw goods. The Zollverein sends a large assortment of comfortable felt shoes, hosiery, and gloves. From France are exhibited fine gloves and boots of exquisite finish, in the manufacture of which she keeps the first place. Austria sends a variety of wearing apparel, including the picturesque Hungarian national costume. From Florence there is a small but excellent assortment of straw goods, for which Italy has been long famous.

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1. Genin, John N., *New York City.*—Manufacturer and Importer.
Gentlemen's hats and caps, in various styles; children's hats and caps; children's clothing; ladies' and children's shoes, silk dresses, dress hats, furs, hosiery, umbrellas, parasols, and canes.

2. Amidon, Francis H., *New York City.*—Manufacturer.
A variety of styles of silk hats.

3. Kellogg, James W., *New York City.*—Manufacturer.
A variety of silk and felt hats and caps.

4. Espenchied, Nicholas, *New York City.*—Manufacturer.
A variety of gentlemen's and children's hats.

5. Knox & James, *New York City.*—Manufacturers.
Gentlemen's black and white silk and beaver hats.

6. Freeman, Alpheus, *New York City.*—Manufacturer.
Silk, beaver, and felt hats for gentlemen; children's hats with feathers; misses' beaver hats; ladies' riding hats.

7. Warnock, R. & J., *New York City.*—Manufacturers.
A variety of military and civil hats and caps of all materials, and in the most modern styles.

8. Small, J., & Co., *New York City.*—Manufacturers.
Life-preserving cap; fancy cloth, velvet, and glazed caps, in great variety; embroidered satin caps for infants.

9. Stevens & Butt, *Norfolk, Virginia.*—Manufacturers.
Cocked hats.

10. Rafferty & Leask, *New York City.*—Manufacturers.
Specimens of hats and caps, with improved style of trimming; hats having the daguerreotype of the owner attached to the inside of the crown.

11. Beaudin, Dominique, *New York City.*—Manufacturer.
A variety of hats and caps.

12. Mealio, Lewis, *New York City.*—Manufacturer.
A variety of hats and caps; canes and brushes.

13. Todd, Ira, *New York City.*—Manufacturer.
Dress and undress hats and caps for the army and navy; hats and caps for gentlemen and boys.

11. Rosenswig, E., *Baltimore, Maryland.*—Manufacturer.
Civil, military, and naval caps.

15. Leary & Co., *New York City.*—Manufacturers.
Gentlemen's silk and beaver hats, of high finish.

16. Hayes, Craig & Co., *Louisville, Kentucky.*—Manufacturers.
Silk felt hats for gentlemen; children's hats with feathers.

17. Baker, John A., *New York City.*—Manufacturer.
United States regulation and other military caps, plumes, &c.

18. Oakford, Charles, *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of fine hats and caps of fashionable styles.

19. Degan, Francis, *New Orleans, Louisiana.*—Manufacturer.
Gentlemen's hats.

[The materials used for making modern hats are silk, the furs of hares and rabbits; and wool; and for the finer kinds, beaver and nutria fur. The body of a beaver hat is made of fine wool and coarse fur, mixed and felted together, and then shaped and stiffened; the covering consists of a coat of beaver fur felted upon the body. Cheap hats are made of coarser materials. The materials to be felted are mixed together by the operation of *bowing*, which depends on the smart vibrations of an elastic string, which disentangles the fibrous substances, tosses them into the air, and causes them to arrange

themselves in a pretty uniform layer or fleece. By pressure, under a light wicker frame and a piece of oil cloth or leather, the filaments unite into a mass of some firmness by the serrations of the fibres which point in only one direction. The cap formed by the union of two of these sheets is dipped into a liquor containing a little sulphuric acid, and is worked by hand in all directions. After this operation, which is called *fulling*, the coating is applied to the body of the hat till a uniform and well-felted hood is formed. The hat is then shaped; the body is rendered waterproof and stiff by a varnish composed of shellac, mastic, and other resins, dissolved in alcohol or naphtha. After drying, the nap is raised by a wire brush or card, and then rubbed with seal skin; they are then dyed in a bath, made usually of logwood, sulphate of iron, and acetate of copper. The plush used for covering common silk hats is a raised nap or pile woven upon a cotton foundation; in the better articles it is made entirely of silk. The various steps of the processes cannot be given in this place. The hat manufacture is one of great importance to the country; the capital invested is about $8,000,000, employing nearly 30,000 persons.]

20. Cripps, Mary E., *New York City.*—Manufacturer.
Ladies' bonnets of peculiar style and rich materials.

21. Isaacs, Mrs. L., *New York City.*—Manufacturer.
Ladies' bonnets and fine millinery.

22. Openhym, Mrs. W., *New York City.*—Manufacturer
Richly trimmed ladies' bonnets.

23. Stuart, Mrs. M. H., *New York City.*—Manufacturer.
Ladies' dress caps.

24. King, Carl, *New York City.*—Manufacturer.
Ladies' dress hats; bonnet made from the June-grass raised in Massachusetts, containing about 300 yards of braid, and of a quality said to be superior to Leghorn.

25. Cantrell, Samuel, *New York City.*—Manufacturer.
Various styles of boots and shoes for ladies, misses, and children.

26. Tate, Isaac E., *New York City.*—Manufacturer.
Assortment of superfine leather and kid boots and shoes.

27. Juell, R., *New York City.*—Manufacturer.
Three pairs of boots.

28. Alles, Philip, *New York City.*—Manufacturer.
Fancy embroidered gaiters and shoes for ladies.

29. Stout, A. V., & Co., *New York City.*—Manufacturers and Agents.
Assortment of boots and shoes; ladies' gaiters and slippers.

30. Lang, Peter, *New York City.*—Manufacturer.
Adjusting spring boots. (Patent applied for.)

[The invention consists in an apparatus placed in the heel of the boot, regulated by means of a small key inserted from the back part of the heel. A few turns, either to the right or left, will expand or contract the boot from 1½ to 2 inches, thus suiting the boot to the wants of the wearer at his pleasure. It is simple, durable, and not liable to get out of order.]

31. Miller & Co., *New York City.*—Manufacturers.
Embroidered white and colored satin gaiters; ladies', misses', and children's gaiter boots and shoes.

32. Shaw, Benjamin, *New York City.*—Manufacturer.
A variety of gaiter boots, shoes, and slippers, for ladies' wear.

33. Kuchen, George, *New York City.*—Manufacturer.
Specimens of fancy boots and shoes; calfskin, cork Oxford boots.

34. Ready, John, *New York City.*—Manufacturer.
Calfskin and patent leather dress boots and shoes for gentlemen.

35. Steiger, Philip, *New York City.*—Manufacturer.
Ladies shoes of satin, velvet, and morocco; silk slippers; socques, or overshoes of patent leather; gentlemen's dress shoes of patent leather.

36. Brooks, Edwin A., *New York City.*—Manufacturer.
Gaiters and shoes for gentlemen's, ladies', and children's wear; waterproof boots, reaching to hips, for California wear.

37. Winter, Archibald, *Rondout, New York.*—Manufacturer.
Pair of shoes without seam.

38. Magee, Patrick, *Brooklyn, New York.*—Manufacturer.
Gentlemen's fine dress boots, of patent leather; rotary-heel boots, &c.

39. Frothingham, Newell & Co., *New York City.*—Manufacturers.
Assortment of ladies', gentlemen's, misses', and children's boots and shoes, of all styles and materials, and of high finish.

40. Ball, Brigham & Co., *Boston, Massachusetts.*—Manufacturers.
Specimens of heavy boots.

41. Eisemann, Mayer, *New York City.*—Manufacturer.
Fine dress boots and shoes for gentlemen's wear.

42. Stetson, Charles B., *Astor House, New York City.*—Manufacturer.
A pair of hunting boots.

43. Rogers, E. T., *Summit Hill, Carbon Co., Pennsylvania.*—Manufacturer.
Seamless shoes.

44. Benkert, Leonard, *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of boots, shoes, and gaiters.

45. Cahill, Sylvester, *New York City.*—Manufacturer.
Gentlemen's and ladies' boots and shoes; ladies' and children's gaiters; slippers of various styles.

46. Underwood, Godfrey, & Co., *Milford, Massachusetts.*—Manufacturers.
Australia and California mining waxed leather and pegged boots; fine sewed boots for gentlemen's wear; boys' and children's boots.

47. King, Daniel R., *Philadelphia, Pennsylvania.*—Manufacturer.
Ladies' and children's fine shoes.

48. Henn, John Edward, *St. Louis, Missouri.*—Manufacturer.
Ornamented pair of boots and shoes.

49. Benedict, J. W., *Galveston, Texas.*—Manufacturer.
Pair of boots made of alligator's skin.

50. American Union Boot, Shoe, and Leather Manufacturing Company, *Woodham, Long Island.*—Manufacturers.
Pegged brogans, boots and shoes, and shoemaker's patent bench.

51. Rosenbaum, I., *St. Louis, Missouri.*—Manufacturer.
Gentlemen's dress boots of patent leather.

52. Jones, H. B., *New York City.*—Manufacturer.
Ladies' and gentlemen's gaiter boots and slippers.

53. Breeden and Brother, *New York City.*—Agents.
India-rubber boots and shoes.

54. Corlies, John W., (Goodyear Metallic Rubber Shoe Company), *New York City.*—Agent.
India-rubber boots and shoes.

[The unsightly India-rubber shoes, formerly made in South America by frequently dipping the lasts in the juice of the tree and drying quickly in smoke, have been entirely displaced by the substantial, light, and elegant articles made from sulphuretted or vulcanized rubber, by the process of Mr. Goodyear.]

55. Frisbie, M. J., *New York City.*—Manufacturer and Agent.
Goodyear's patent metallic rubber boots and shoes.

56. Gittens, John K., *Williamsburgh, New York.*—Manufacturer and Proprietor.
Transferable waterproof cork sole for boots and shoes in wet weather.

57. Munroe, Alfred, & Co., *New York City.*—Manufacturers.
Specimens of ready-made clothing for gentlemen and boys.

58. Rogers, P. L., & Co., *New York City.*—Manufacturers.
A variety of embroidered clothing for children.

59. Hollander, Mrs. Maria, *Boston, Massachusetts.*—Manufacturer.
Various articles of children's clothing; wax figure arrayed.

60. Lacroix, F., *New Orleans, Louisiana.*—Manufacturer.
Coats, vests, and pantaloons.

61. Williams, Thomas P., *New York City.*—Manufacturer.
Fashion plate.

62. Perego, Ira, & Son, *New York City.*—Manufacturers.
Ready-made linens, cravats, hosiery, money-belts, and other furnishing goods for gentlemen.

63. Bell, Thing & Co., *Boston, Massachusetts.*—Manufacturers.
Woollen under-garments and hosiery.

64. Shirt Sewers and Sempstresses Union, *New York City.*—Manufacturers.
Specimens of fine and embroidered shirts.

[This society was organized March 3d, 1851. Its object is to relieve the oppressed needlewomen of the city by giving them a just compensation for their labor. The embroidered shirt was made by a woman sixty years old.]

65. Leighton, Charles, *New York City.*—Manufacturer.
A variety of fine and embroidered shirts; and dressed model to exhibit shirt and pantaloons.

66. Green, G. T., *New York City.*—Manufacturer.
A variety of shirts, collars, cuffs, neckcloths; vest-shirt, &c.

67. Gardner, O. W., & Co., *Boston, Massachusetts.*—Manufacturers.
Specimens of ladies', misses', and gentlemen's wove knitted woollen hosiery, in great variety.

68. Van Houten, Mrs., *New York City.*–Manufacturer.
A variety of articles for gentlemen's wear; shirts, collars.

69. Wakefield Manufacturing Company (Thomas R. Fisher, President), *Germantown, Pennsylvania.*—Manufacturers.
Fancy hosiery, scarfs, tippets, hoods, of woollen and zephyr worsteds; silk shirts and drawers.

70. Voorhees, Mrs. Betsey R., *Amsterdam, Montgomery, Co., New York.*—Manufacturer.
A variety of useful and ornamental articles of wearing apparel, made exclusively of home-made materials by the exhibitor, consisting of:
A vest made from the list of a piece of cloth manufactured by the Northampton Woollen Company, of which a suit of clothes was made and presented to Henry Clay, in 1844; the vest was embroidered with thread spun from flax which grew on his farm.
Two pairs of lace cotton stockings.
A linen cravat made of homespun linen thread.
A pain of homespun woollen stockings.
A pair of thread lace stockings made from flax which grew on Henry Clay's farm.
Two pairs of thread lace stockings made from flax which grew on the exhibitor's farm.
A pair of cotton lace stockings knit from yarn spun by the exhibitor.
A table cloth and pair of embroidered pillow cases spun and wove in the exhibitor's house.
A pair of embroidered slippers wholly made by the exhibitor.
A linen stock made from homespun linen thread.
A wrought handkerchief.
A wrought collar and sleeves, embroidered with homespun thread.
A crochet collar made of homespun thread.
A child's sack—the cloth (scarlet merino), was manufactured from wool grown upon the farm, by the exhibitor in her own house (the weaving only excepted)—the worsteds used in the embroidery were made by herself.
A picture frame made three years since, containing four small drawings, with a pen, in imitation of line engraving.
A pair of kid gloves, cut and made by the exhibitor from leather dressed in the neighborhood.
An imitation ivory fan made from the bone of a cow.
Various specimens of marking and ornamenting with a pen, without a pattern, with ink of her own making.

[The above exhibition can hardly be too highly praised, for the lesson it teaches to American housewives of what may be made from materials existing in abundance at their own doors. The skill and taste displayed in the above articles are alike honorable to the mind which could conceive the idea, and the hand which could execute a work that points to an independence of foreign countries deserving the careful attention of every true American woman. These articles, in the eyes of all thinking persons, must be of infinitely more value than acres of Berlin-wool embroidery, and miles of ornamental patch-work.]

71. Twiss, John, *Germantown, Pennsylvania.*—Manufacturer.
Extensive assortment of knit woollen scarfs, hoods, stockings, under garments, &c.

72. Doughty, Samuel H., *New York City.*—Manufacturer.
Varnished leather belts for ladies, children, firemen, and military companies: cap bands, and other leather goods.

73. Lasak, F. W., & Son, *New York City.*—Manufacturers.
A variety of rich silk dresses.

74. Bartholomew & Weed, *New York City.*—Manufacturers.
Wax figure, arranged in full mourning walking costume.

75. Simmons, William, *New York City.*—Manufacturer.
Specimens of straw goods and millinery articles.

[A variety of materials from the vegetable kingdom have been used in the manufacture of bonnets and summer hats. Of these, wheat straw is well adapted, both for the fine and coarse plait; rye straw, palm leaf, and splints from the willow-tree, are also extensively used. Plait straw is from wheat, the best quality of which grows on dry, chalky lands, as that well-known as Dunstable straw; the middle part of the straw, above the last joint, is selected; it is cut into lengths of about ten inches, which are then split by a single machine into slips of the requisite width. The Leghorn or Tuscan plait is from a variety of bearded wheat, grown expressly on poor soils, cut when green, and then bleached. Many of the grasses are available for this purpose, as the *June-grass*, exhibited in No. 24. "Whole Dunstable" signifies that the plait is formed of seven entire straws; while "patent Dunstable" consists of fourteen split straws.]

76. Nyström, Ernest V., *New York City.*—Manufacturer.
Lady's embroidered vest.

77. Mauny, Madame J., *New York City.*—Manufacturer.
Ladies' corsets, of superior finish.

78. Bulpin, George, *New York City.*—Manufacturer and Importer.
Domestic and imported mantillas, cloaks, and shawls.

79. Brodie, George, *New York City.*—Manufacturer and Proprietor.
Silk dresses and embroidered mantillas.

80. Sallenbach, Mrs. Barbara, *New York City.*—Manufacturer.
White satin corsets embroidered with gold; black satin shoulder braces wrought with silver thread.

81. Cowperthwaite, Mrs. C. J., *Staten Island, New York.*—Manufacturer.
Wrought dress made of straw.

82. McCune, Haskell & Co., *New York City.*—Manufacturers.
A variety of mantillas.

83. Bennett, Frank, & Co., *New York City.*—Proprietors.
Embroidered cloak and mantilla; ladies' straw hats.

84. Oliver, Thomas, *New York City.*—Proprietor.
Apparatus for measuring and drafting coats.

85. Taylor, S. T., *New York City.*—Inventor and Proprietor.
Original plan and patterns for cutting ladies' dresses.

86. Githens, Mrs. Rebecca, *New York City.*—Designer.
Patent demonstrative scale for cutting ladies' dresses.

[Arranged from actual measurements. This very simple plan avoids the old tedious method of pinning on and fitting the pieces, and secures a better fitting dress.]

87. Demorest, Mrs. M. W., *New York City.*—Inventor.
Dress chart, for cutting ladies' dresses, without fitting or trying on. Any one, with this chart and a tape line, can cut and fit her own dress.

[Any plan which promises to do away with the old tedious and bungling method of fitting ladies' dresses, will certainly be hailed as an important invention. There is no good reason why the same system of measurements which have been found so useful and correct in making men's clothes, should not be applied with equal success in cutting and fitting ladies' dresses.]

88. Ramsburg & Ebert, *Georgetown, D. C.*—Manufacturer.
An extensive assortment of fine buckskin gloves and gauntlets.

89. Flugh, A., & Co., Manufacturers.
Fine buckskin gloves.

GREAT BRITAIN AND IRELAND.

90. Creak, James, *Wisbech, England.*—Inventor and Manufacturer.
Improved waterproof button, ankle, and Blucher boots; screw-bottomed shoes, without stitches or welts.

91. Jackson, Brothers, *Liverpool, England.*—Manufacturers.
A cherry-satin dress waistcoat, embroidered with black lace.

92. McDona, George, *London.*—Inventor and Manufacturer.
Life-buoy vest.

93. Kennedy, Miss Honora, *Clonmel, Ireland.*—Manufacturer.
A variety of stays.

94. Johnston, Brother, & Townsend, *Manchester, England.*—Manufacturers.
An extensive assortment of gloves, hosiery, and under garments.

[The hosiery-knitting trade of England is carried on most extensively in Nottinghamshire, Derbyshire, and Leicestershire. It has been estimated that there are at least 50,000 stocking-frames in the United Kingdom, employing about 100,000 workers of both sexes. Steam-power has been successfully applied to rotary machinery; one of these machines will produce in a week frame-work sacks enough to be made into 100 dozen of women's small hose, and at the price of 2*s.* 2*d.* per dozen. In 1851, the annual value of cotton hosiery was £800,000; that of worsted, &c., £870,000; and of silk, £241,000—in this manufacture, 4,584,000 lbs. of raw cotton; 6,318,000 lbs. of English wool, and 140,000 lbs. of silk were used; over a million pounds sterling capital is invested.]

95. Hall, Brothers, *Nottingham, England and New York City.*—Manufacturers.
An extensive assortment of hosiery, under garments, and gloves.

96. Sisters of Mercy, *Kinsale, County Cork, Ireland.*—Manufacturers.
A variety of cotton and woollen hosiery and gloves.

97. Smyth & Co., *Dublin, Ireland.*—Manufacturers.
Specimens of Balbriggan hosiery.

98. Begg, Mrs., *Ayr, Scotland.*—Manufacturer.
A pair of stockings knitted by the exhibitor (a sister of the poet Burns), at the age of 82.

99. Fownes, Brothers, *Cheapside, London.*—Manufacturers.
An extensive assortment of gloves.

BRITISH COLONIES.—CANADA.

100. Martel, Madeline, *St. Ambroise, Canada East.*—Manufacturer.
Straw bonnets and hats.

101. Couture, Madame, *St. Ambroise, Canada East.*—Manufacturer.
Straw hats, and knitted woollen stockings.

102. Martel, Judith, *St. Ambroise, Canada East.*—Manufacturer.
Straw hats.

103. Descherons, Miss Lorette, *Canada East.*—Manufacturer.
Straw bonnets and hats.

104. Picard, Madame Louis, *Canada East.*—Manufacturer
Hay and Tuscan hats.

105. Keenan, Miss Julia, *St. Sylvestre, Canada East.*—Manufacturer.
A fancy straw bonnet.

106. Quintalle, Madame, *Vercheris, Canada East.*—Manufacturer.
Tuscan bonnet and hats.

107. Barbeau, Jos., *Quebec, Canada East.*—Designer and Manufacturer.
A pair of cavalier or driving boots, extending to the hips; and a pair of original snow-shoe fastenings.

108. Quebec Local Exhibition Committee.—Proprietors.
Men's and women's snow-shoes, and mooseskin mocassins; slippers and slipper patters, manufactured and ornamented by the Indians of Lorette, near Quebec.

[These shoes are very light, being made of a delicate but strong frame of wood, the inclosed space consisting of a net-work of animal fibre. They are worn by all classes, when travelling in the snow; without them the poorer classes would hardly be able to leave their homes in the winter season. They are used in the chase of the deer and other game; one accustomed to their use can travel at the rate of from seven to ten miles an hour. They are also much used in the amusement of racing, both by Canadians and Indians.]

109. Gordon, James, *Quebec, Canada East.*—Manufacturer.
A lady's fancy boot.

110. Hudson's Bay Company, *Lachine, Canada East.*—Proprietors.
A pair of snow-shoes.

111. Polson, John, *Toronto, Canada West.*—Designer and Manufacturer.
A pair of brogues, cut from a single piece of leather, with vellum cut pattern.

112. Geuch, Madame Laurent, *Canada East.*—Manufacturer.
Specimens of woollen stockings.

113. Joben, Madame, J. B., *Quebec, Canada East.*—Manufacturer
A pair of knitted woollen over-socks.

114. Bouchard, Madame, *St. Valiere, Canada East.*—Manufacturer.
Knitted woollen night-caps.

115. Aubé, Madame, *Canada East.*—Manufacturer.
Specimens of woollen stockings.

116. Tetu, J., *Berthier, Canada East.*—Manufacturer.
Woollen night-caps.

117. Martel, Miss P., *St. Ambroise, Canada East.*—Manufacturer.
A knitted woollen comforter.

118. Thompson, Mrs., *Quebec, Canada East.*—Manufacturer.
An infant's knitted dress.

119. Adams, W., & H. F., *Montreal, Canada East.*—Manufacturers.
A reversible coat, Canadian cloth capot on one side, and fine drab cloth overcoat on the other.

NEWFOUNDLAND.

120. Hills, *St. Johns.*—Manufacturer.
Caps of otterskin, plucked and unplucked.

121. Morrison, *St. Johns.*—Manufacturer.
Fine sealskin boots, with and without the hair on.

FRANCE.

122. Coupin, Jerome, *Aix, Rhone.*—Manufacturer.
Specimens of fine felt hats.

123. Lejeune, *Rue St. Honoré, Paris.*—Manufacturer.
Felt and silk hats.

124. Demenge & Erhard, *Rue du Claire, Paris.*—Manufacturers.
A variety of straw hats.

125. Ernoux, Charles Henry, *Avoye, Paris.*—Manufacturer.
Fancy beaver hats for children.

126. Moretton (Successor of Drez), *Rue Paradis au Mavais, Paris.*—Manufacturer.
Fine hats for gentlemen.

127. Guignet, *Arles, Bouches du Rhone.*—Manufacturer.
Specimens of undressed hats and caps; hat-boxes in imitation of leather.

128. Poirier, P., *Chateaubriant, Loire Inférieure.*—Manufacturer.
Various specimens of hunting and full-dress boots and shoes for gentlemen.

129. Trinidat, —Manufacturer.
Specimens of wooden shoes.

130. Viault-Este, *Rue de la Paix, Paris.*—Manufacturer.
Ladies' boots, shoes, and slippers of every description.

131. Clercx, A., *Boulevard des Italiens, Paris.*—Manufacturer.
A variety of boots and shoes.

132. Chapelle, G., *Boulevard des Italiens, Paris.*—Manufacturer.
Boots, shoes, and slippers, of fine quality and in various styles.

133. Dufossee, *Rue de la Paix, Paris.*—Manufacturer.
Ladies' boots and shoes of improved styles.

134. Forr, J., *Rue St. Honoré, Paris.*—Manufacturer.
Gentlemen's fine boots and shoes, of various descriptions.

135. Contour, Frederic, *Rue des Déchargeurs, Paris.*—Manufacturer.
Various articles of wearing apparel; fancy articles of crochet work.

136. Minat, E., *Rue de l'Echiquier, Paris.*—Manufacturer.
A robe of white crape, painted " à l'Australienne."

137. Werly, Robert, & Co., *Bar le Duc, Meuse.*—Manufacturers.
Fine corsets, without seams, on a new system.

138. Suchet, Damas, *Thiry, Rhone.*—Manufacturer.
Embroidered silk corsets, without seams.

139. Dutertre, Alph, *St. Denis, Paris.*—Manufacturer.
Waterproof coats and surtouts, of silk and cotton.

140. Darnet, Desire, *Rue Richelieu, Paris.*—Manufacturer.
Ready-made shirts, with embroidered fronts.

141. Valtat & Rouillé, *Rue Rambuteau, Paris.*—Manufacturer.
Ready-made shirts; shirt fronts and collars made by machinery and by hand.

142. Hayem, S., Sen., *Rue du Sentier, Paris.*—Patentee and Manufacturer.
Cambric shirts, cravats, and collars.

143. Milon, Sen., *Paris.*—Manufacturer.
Silk hosiery, and other apparel for theatrical uses.

144. Amos, Jaques, *Wasselonne, Bas Rhin.*—Manufacturer.
Woollen shirts; wooden shoes or sabots.

145. Jeanclaude & Co., *Paris.*—Manufacturers.
A variety of woollen knit embroidered shoes for infants.

146. Nathan, Beer, Trefousse, & May, *Paris.*—Manufacturers.
Ladies' and gentlemen's fine silk and kid gloves, of all varieties.

147. Banquette, *Paris.*—Manufacturer.
Fine kid gloves.

148. Terray, Brothers, *Rue Montmartre, Paris.*—Manufacturers.
Various specimens of Paris gloves; the skins and gloves in different stages of manufacture.

149. Texier, T., Jr., *Niort, Deux Sevres.*—Manufacturer.
Gloves of deer, chamois, castor, and sheepskins; with the skins.

150. Tailbonis, *Rue des Bourdonnais, Paris.*—Manufacturer.
Silk, thread, and woollen gloves.

151. Brochier & Son, 18 *Rue de St. Laurent, Grenoble.*—Manufacturers.
A variety of gloves.

152. Jouvin, V. H., & Co., *Rue Rougemont, Paris.*—Manufacturers.
Specimens of superfine gloves, with the leather from which they are made; unfinished gloves; tools and implements used.

[The French are remarkable for the beautiful and varied colors of their gloves; nearly 100 different colors may be recognized.]

153. Compere, E., *Rue Croix des Petits Champs, Paris.*—Manufacturer.
A great variety of gloves.

154. Courvoisier, Ph., *Rue des Bons Enfants, Paris.*—Manufacturer.
Fine kid gloves.

155. Caldesaigues & DinIot, *Rue Thevenot, Paris.*—Manufacturers.
Superfine gloves.

156. Chosson & Co., *Rue Montmartre, Paris.*—Manufacturers.
Ladies' and gentlemen's gloves; with leather not made up.

157. Aubry, G., & Dumorcet, *Paris.*—Manufacturers.
A variety of gloves.

158. Bajou, *Paris.*—Manufacturer.
A variety of gloves; instruments on which they are cut out.

THE GERMAN STATES.

159. Kloss, George, *Brunswick.*—Manufacturer.
A variety of boots and shoes.

160. Muehle, August, *Pirna, Saxony.*—Manufacturer.
Ladies' woollen shoes; gentlemen's boots and shoes of felt.

161. Albertus, Alexander, *Eisenberg, Saxe-Altenburg.*—Manufacturer.
A variety of shoes.

162. Heinze, Edward, *Eisenberg, Saxe-Altenburg.*—Manufacturer.
Slippers made of plush.

163. Ziegler & Reisse, *Ruhla, Thuringia.*—Manufacturers.
An assortment of boots, shoes, and gaiters; hosiery.

164. Albrecht, T. H., *Bremen.*—Manufacturer.
Boots and shoes of calfskin and patent leather.

165. Ebner, John, *Hanover.*—Manufacturer.
A variety of boots and shoes.

166. Scadd, Auton, *Lower Bavaria.*—Manufacturer.
Boots and shoes.

167. Pfeiffer, C., *Berlin, Prussia.*—Manufacturer.
Boots, shoes, and overshoes.

168. Marthaus, A., *Oschatz, Saxony.*—Manufacturer.
Boots, shoes, and slippers, made of felt.

169. Roempler, J. S., *Erfurt, Saxony.*—Manufacturer.
Shoes and shoe stuffs of mixed silk and India-rubber; India-rubber elastic braces and watch guards.

[The material used in making braces and similar articles is cut spirally from bottle India-rubber, by means of a small rotating knife, kept wet by a water-drip. Very long threads are thus obtained, which are readily joined together by putting the freshly cut surfaces in contact. By winding the threads on reels, and leaving them in a state of tension for some weeks, they lose their elasticity, and may be easily woven into braid. On exposure to steam, the elasticity returns, and the fabric is shortened.]

170. Cadura, Heinrich, *Breslau, Prussian Silesia.*—Manufacturer.
Waterproof cloaks, which may be washed like linen.

171. Mechanics' Club, *Lauban, Prussian Silesia.*—Manufacturers.
A gentleman's black coat.

172. Clothes Magazine, *Breslau.*—Manufacturers.
Ready-made coats.

173. Gerson, Hermann, *Berlin.*—Manufacturer.
Mantillas of embroidered silk and velvet.

174. Stecher, Johann, & Co., *Carlsruhe, Baden.*—Manufacturers.
Corsets without seams.

175. D'Ambly, Carl, & Co., *Stuttgard, Wurtemberg.*—Manufacturers.
Specimens of corsets without seams.

176. Corset Manufactory, *Wurtemberg.*—Manufacturers.
Specimens of corsets.

177. Hoessler & Sons, *Rabenstein, near Chemnitz, Saxony.*—Manufacturers.
A variety of hosiery; cotton and thread gloves.

178. Lenz, J. W., *Berlin.*—Manufacturer.
Knitted caps, hose, scarfs, and socks.

179. Zimmermann, Christian, & Son, *Apolda, Saxe Weimar.*—Manufacturers.
Various cotton and woollen hosiery, and fancy goods.

180. Rust, F. A., *Offenbach-on-the-Maine.*—Manufacturer.
Specimens of hosiery and purses, in tricot.

181. Fabien, J. G., *Bautzen, Saxony.*—Manufacturer.
Specimens of woollen hosiery.

182. Morschel, Winzenried, & Co., *Herrnhaag, Hesse Darmstadt.*—Manufacturers.
An assortment of woollen hosiery, gloves, and caps.

183. Woller, F. E., *Stollberg, Saxony.*—Manufacturer.
An extensive assortment of gloves, hosiery, and under garments.

184. Bierling, Julius, *Dresden, Saxony.*—Manufacturer.
French kid gloves, for ladies and gentlemen.

185. Behr, G. F., *Chemnitz, Saxony.*—Manufacturer.
A variety of silk gloves.

186. Kohler, Brothers, *Altenburg, Saxe-Altenburg.*—Manufacturers.
Specimens of gloves of various kinds.

187. Ranniger, H. L., & Sons, *Altenburg.*—Manufacturers.
An extensive assortment of kid gloves for ladies.

THE AUSTRIAN EMPIRE.

188. Kalkbrunner, R., *Bassano, Lombardy.*—Manufacturer.
Venice straw bonnets and hats.

189. Krach, Brothers, *Prague, Bohemia.*—Manufacturers.
Gentleman's shooting dress complete.

190. Nessel, C., *Oedenburg, Hungary.*—Manufacturer.
A coat and waistcoat.

191. Singer, Jos., *Pesth, Hungary.*—Manufacturer.
An elastic dress coat.

192. Malatinzky, E., *Mispolz, Hungary.*—Manufacturer.
Hungarian national dress, called *Szur.*

193. Geyer, John, *Pesth, Hungary.*—Manufacturer.
A Hungarian sheepskin Bunda.

194. Rigo & Kraetschmar, *Rima, Szombath, Hungary.*—Manufacturers.
Two Hungarian shooting jackets.

195. Glovers' Association, *Prague, Bohemia.*—Manufacturers.
Samples of gloves of various kinds and colors.

THE ITALIAN STATES.

196. Allegri, Antonio, *Florence, Sardinia.*—Manufacturer.
Boots and shoes for ladies and gentlemen.

197. Forno, Giovanni, *Turin, Sardinia.*—Manufacturer.
A full dress suit for a gentleman.

198. Nannucci, Signora Agnese, *Florence.*—Manufacturer.
Specimens of fine straw bonnets and braid.

BELGIUM.

199. Berger, Madame, *Brussels.*—Manufacturer.
Nymph corsets, of high finish.

200. Schmidt, Goldenburg, & Co., *Liège.*—Manufacturers.
Woollen and cotton hose, and night-caps.

THE NETHERLANDS.

201. Coopman, W. A., *Arnhem, Netherlands.*—Manufacturer.
Reversible coat.

202. Jongmans, A., *Leyden, Netherlands.*—Manufacturer.
Various articles of wearing apparel.

203. Kaiser, G. C. F., *Amsterdam, Netherlands.*—Manufacturer.
A variety of chamois and buckskin gloves.

SECTION III. CLASS XXI.

CUTLERY, EDGE AND HAND TOOLS.

In the present class may be found knives and other sharp instruments known under the general denomination of cutlery, and edge and other hand tools used in manufacturing processes, and not included in Class VI. The tools are such as require skill in the operator, rather than mechanical power. Two important sections of those articles usually called cutlery are not included in this class; they are surgical instruments, which form a section of Class X., and swords with similar warlike weapons, which are arranged in Class VIII.

In reading the following catalogue, or in examining the articles themselves, it will not fail to be noticed that the contributions indicate, to a considerable extent, the condition and habits, the social and industrial wants of the people from which they are sent. As a general rule, each country excels in those manufactures for which its physical condition furnishes facilities and makes a demand. The American axe, for example, is a tool peculiar to this country, invented and brought to perfection to satisfy a prevailing want of our population. Similar instances will occur to every intelligent reader. The United States possesses unusual advantages for manufacturing cutlery. Our iron ores are abundant in every part of the country; they are easily worked, and in most cases convenient to the coal necessary to reduce them, and they possess every variety of excellence suited to the different kinds of tools. The larger sorts of edge-tools are already made of the best quality, and finer cutlery is made at several flourishing establishments.

The beautiful cutlery of Sheffield still maintains its ancient reputation for exquisite finish and temper. A great variety is exhibited. Very many small collections are sent from Austria. All these specimens are of the cheapest kind of table and pocket cutlery. It is, however, the manufacture best suited to the wants of the Austrian people, and shows the condition and extent of their industry.

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1. Union Knife Company, *Naugatuck, Connecticut.*—Manufacturers.

Pocket knives, with horn, India-rubber, ivory, pearl, silver, and steel handles; pruning and budding knives; camp knives for miners; scimitar, dagger, and cleaver blades; silver fruit-knives; toilet-knives; many-bladed knives.

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2. Collins Company, *Hartford, Connecticut.*—Manufacturers.

A fine collection of adzes, axes, cleavers, hatchets, chisels, stone hammers, and mallets.

[In the manufacture of an axe, a piece of iron, after being heated, is bent over a piece of steel corresponding in form to the intended eye of the instrument; a piece of steel to form the cutting edge is heated with the iron back to a welding heat, and is passed under a large tilt-hammer, driven by steam or water-power, which flattens it out; it is then exposed to another heat, and the eye is completed with the small hammer. After the superfluous iron and steel have been removed by scissors, the metal is tempered; the process of grinding on stones cuts away the iron and exposes the steel edge. The glazing on emery wheels succeeds, and the polish is given by means of oil and emery; a blue varnish is generally applied, which, on drying in a stove, improves the appearance of the axe.

The value of these and other edge tools depends on the process of *tempering*. It is a property of steel to become, by sudden quenching in water when at a red heat, extremely hard, and of being again softened to any required degree by the application of heat. The temperature necessary to give the temper required for different instruments is often estimated by the workman by the color of the heated surface; thus at 430° Fahr., the color is pale, inclining to yellow, which is that at which lancets are tempered—at 450° a pale-straw color is seen, considered the best for razors and surgical instruments—at 470° a full yellow is produced, suitable for pen-knives and pocket cutlery—at 490° a brown color is produced, proper for scissors, shears, cold chisels, &c.—at 510° the brown becomes dappled with purple, which is the best for axes, common chisels, &c.—at 530° a purple color is produced, at which table cutlery is tempered—at 550° a bright blue, suitable for swords and watch-springs—at 560° a full blue, used for fine saws, augers, &c.—at 600° a dark blue, attended with the softest of all the grades of temper, and used only for the larger saws. Other modes of tempering are by smearing the steel with oil or tallow, and judging of the heat by the appearance of the smoke or flame arising from these ingredients. A still more accurate way is to immerse the steel in some fluid medium, the temperature of which is kept regulated by the thermometer—oil is used for this purpose for any temperature below 600° Fahr. Mr. Parkes, in his chemical essays, recommends metallic baths, composed of different proportions of lead and tin and bismuth, which fuse at definite temperatures, and may be used in tempering with great accuracy from 420° to 612° Fahr., the last being the temperature of melting lead.]

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3. New York Knife Company, *Matteawan, Dutchess Co., New York.*—Manufacturers.

Specimens of fine pen and pocket cutlery; self-protecting pistol knives; hunting, sportsmen, and dirk knives; desk and pen-machine knives; army and navy knives, with fork and spoon; gardeners', pruning, and budding knives; pencil, congress, and pen-knives, of every description, with richly carved handles of pearl, shell, ivory, and stag-horn, with California gold and fine silver mountings.

[Penknives are made from cast steel, which is the only kind susceptible of a high polish. Their blades are forged from the end of a rod, and cut off, leaving enough to form the joint; the nail mark is given by a chisel while the steel is hot; they are hardened in cold water, and tempered on an iron plate. The quality of the blade is the most important; the various forms and materials of the handles are secondary, though to the latter is most frequently due any increase above the ordinary price.]

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4. Ohio Tool Company, *Columbus, Ohio.*—Manufacturers.

Planes and edge tools for carpenters, joiners, and coopers; improved screw-arm plough plane.

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5. Eagle Works, *West Winsted, Connecticut.*—Manufacturers.

Specimens of fine table cutlery, with plain and ornamented ivory and pearl handles.

[Table knives are mostly made of shear steel, or ordinary blistered steel rolled or beaten down into bars. The blade is first rudely formed, and welded to a piece of iron, out of which the shoulder and tang (or part which enters the handle) are made; the shape is given to the shoulder (or bolster) by hammering in a die and swage; it is afterwards tempered and ground. Forks are made of small rods of steel, drawn out flat at one end to the length of the prongs; the shape is given to the shank and tang, when heated, by a die and swage; the prongs are formed by a stamp weighing about 100 lbs., falling from a height of seven or eight feet upon the heated end of the rod, the flat, thin piece between the prongs being cut out with a fly-press—they are then annealed, filed, bent into shape, and hardened. The knives now used for the table are generally of the plainest shape, and with balance handles (in which the weight of the handle is such as

to keep the blade from touching the table when left to its natural balance). There is, however, the greatest diversity in the form and materials of the handles; the most common materials are wood, horn, bone, ivory, pearl, and, recently, vulcanized India-rubber, which are made into a great variety of forms, sometimes the most fantastic—since it has become unfashionable to introduce the knife into the mouth, forks are made with three or four tines or prongs, and the instrument is now made to perform many of the duties formerly required of the spoon.

The dry-grinding of cutlery is an occupation which has been very ruinous to health, from the inhalation of the fine metallic particles and dust; a pulmonary complaint, called the "grinders' disease," is the result, which has long engaged the attention of philanthropists and physicians; few who commenced work at this at an early age reached the age of forty years. An apparatus has been used with success in England to prevent this accumulation of dust in the air; it consists of a powerful fan, which draws the particles as they are thrown off down a pipe, leaving the atmosphere perfectly clear; it is almost universally adopted, and the complaint, formerly so common and so incurable, has ceased to exist where it is used. The stones upon which the grinding is performed revolve with very great rapidity, the surface in some cases passing over six or seven hundred feet in a second; stones are not unfrequently burst by their own centrifugal force; this accident is now also provided against by proper coverings.]

6. New England Cutlery Company, *Wallingford, Connecticut.*—Manufacturers.
An extensive assortment of pocket cutlery; colossal and miniature knives.

7. Smith, S. W., & Brothers, 50 *Maiden Lane, New York City.*—Manufacturers and Importers.
Fine table cutlery, in various styles.

8. Seymour Manufacturing Company, *Seymour, Connecticut.*—Manufacturers.
Augurs and augur-bits of all varieties.

9. Douglass, Thomas, 5 *Platt Street, New York City.*—Agent.
Specimens of chisels from the manufactory of John Sharpe, New York City.

10. Simmons, D., & Co., *Cohoes, Albany Co., New York.*—Manufacturers.
A variety of axes, and other-edge tools, and the same in miniature.

11. Aviset, Amédée, 590 *Broadway, New York City.*—Manufacturer.
Table cutlery, dirks, bowie knives, hunting knives, pen and pocket knives, scissors, and other cutting instruments.

12. Fenner, Thomas, & Co., 18 *Platt Street, New York City.*—Proprietors.
A variety of cutlery.

13. Garside, John, *Washington Factory, Newark, New Jersey.*—Manufacturer.
Specimens of table cutlery, with ivory handles ornamented with medallions of distinguished persons, and in other original styles, executed by machinery.

14. Tomes, Francis, & Sons, 6 *Maiden Lane, New York City.*—Importers.
Fine cutlery of various descriptions; fine razors and knives.

15. Heinisch, Rochus, *Newark, New Jersey.*—Inventor and Manufacturer.
Tailors' patent shears; bank shears; scissors of various descriptions; a new style of razor, patented.

16. Ibbotson, Henry J., & Co., 218 *Pearl Street, New York City.*—Manufacturers.
A variety of long, and circular, and hand saws.

[Saws are made from steel plates rolled for the purpose. They act as wedges to tear their way through an obstacle. They are either reciprocating or circular; the common hand saw and the pit saw are examples of the former. All saws are hardened and tempered in oil, and their irregularities are removed by hammering and grinding. The several forms of the teeth are those best fitted for their several purposes; the "set" of the saw is the inclining of the teeth at an angle known to be the best for allowing the escape of the sawdust. The toothing, as also the polishing and grinding, are performed by machinery. The tooth of a ripping saw, for cutting in the direction of the woody fibres, is more or less hooked, that of the pit saw being shaped something like the upper mandible of a parrot; while the tooth of a cross-cut saw returns from its point at an equal angle on both sides of a line at right angles to the edge of the blade; so that while the ripping saw cuts only in the down stroke, the cross-cut saw can cut both ways, and it actually does when worked at both ends, as in the long saws used in cutting large logs. The saw blade is generally thicker at the cutting edge than at the back, that it may not bind in the cut; in the cross-cut saw the set of the teeth prevents binding. Tenon saws are mainly cross-cut saws, for cutting in the shoulders to tenons; to secure sufficient rigidity to their blades, they have usually a brass back. Narrow-bladed saws, for cutting in curved lines, are thickest at the edge, and the teeth are not set.

Circular saws were invented in Holland about 1780; they are better adapted to power, and are very rapid and precise in their action; the machine which turns the saw sometimes draws forward the piece of wood, and will work with such fineness as to make twenty cuts to the inch. Circular saws have their teeth very accurately divided by a division plate, thus securing uniformity of size and action, and greater smoothness in the work. The larger sizes are made in segments, and connected together by means of dovetails.]

17. Rowe, John, 205 *Pearl Street, New York City.*—Manufacturer.
Shears and scissors, of various descriptions.

[Ladies' scissors are made of the best cast steel; larger scissors are composed of shear steel edges welded to a blade of iron. The bows are developed from solid steel by dexterous blows of a hammer on an anvil; the same very simple tools are used in the common and in the costly varieties; most of the elaborate designs are developed from a solid shank by means of the file and the chasing-tool, often at the expense of much time and skill. The general shape is also given by hammering; the halves are finished by filing and grinding.]

18. Leverett, John, 28 *Cliff Street, New York City.*—Agent.
A variety of axes for wood-cutters and carpenters; hatchets and other edge-tools; California pickaxes, one arm conical, the other flattened.

19. Ives, Henry, *West Meriden, Connecticut.*—Manufacturer.
A patent circular saw.

20. Harris, Joseph, *Boston, Massachusetts.*—Proprietor.
A saw.

21. Boyd & Keen, 11 *Gold Street, New York City.*—Agents.
Specimens of chisels.

22. Pooley, Samuel J., *Warren, New Jersey.*—Manufacturer.
Miniature sets of table cutlery, richly mounted; miniature penknives; razors; surgeons' histouries.

23. Leonard & Wendt, *New York City.*—Manufacturers.
Tailors' patent improved shears; bank shears.

24. Houston, Daniel, 676 *Water Street, New York City.*—Manufacturer.
Cooper's crose.

25. Berrian, J., & Co., 601 *Broadway, New York City.*—Manufacturers and Agents.
Specimens of fine table and useful cutlery.

26. Hannum, Caleb W., *Chester Village, Massachusetts.*—Manufacturer.
A variety of axes, broadaxes, hatchets, and adzes.

27. Walcott, Brothers, *Boston, Massachusetts.*—Manufacturers.
Walcott's patent graduating button-hole cutters.

28. Sheehan, C. H., *Maiden Lane, New York City.*—Agent.
Specimens of fine pocket cutlery and razors.

29. Cunningham & Daggett, *Cincinnati, Ohio.*—Manufacturers.
A case of edge-tools.

30. Carpenter, E. W., *Lancaster, Pennsylvania.*—Manufacturer.
Carpenters' and cabinetmakers' tools.

31. Barnes, Charles L., 9 *Cottage Place, New York City.*—Patentee and Manufacturer.
Patent expansion bits for boring wood; 160 different sized holes are exhibited bored by three bits.

32. Converse, Charles A., *Norwich, Connecticut*—Manufacturer.
Specimens of screw augers and auger bits, of different sizes.

33. Churchill, Willis, *Hamden, Connecticut.*—Manufacturer.
A variety of screw augers, auger bits, and gimlets, of fine quality, made of American steel.

[For a long time America imported all her steel from England, who in her turn obtained the iron to make it from Sweden. Within the last few years steel has been made at the Adirondac Works, in Jersey City, which has been pronounced superior for many purposes to the best English cast steel. There are also extensive works in Connecticut and other States in successful operation. The ore for the first-named works is obtained from Essex County, New York, near the sources of the Hudson River, among the Adirondac Mountains; it is there converted into bar-iron—anthracite coal has been successfully used in the furnaces, and blacklead crucibles which will withstand their intense heat.

34. Burr, Waterman & Co., 114 *Water Street, New City.*—Manufacturers.
A patent circular saw.

GREAT BRITAIN AND IRELAND.

35. Rodgers, Joseph, & Sons, *Sheffield, England.*—Manufacturers.
Sportsman's many-bladed knife, of large size, embossed with views of various cities and other objects, the handle of richly carved mother-of-pearl, twelve inches long, representing a boar hunt on one side, and the death of the stag on the other.

[This curious instrument, containing eighty blades and other instruments, is of admirable workmanship, and is worthy of notice on account of the ornaments etched on its polished surfaces by means of aquafortis.]

36. Wostenholm, George, & Sons, *Sheffield.*—Manufacturers.
A variety of fine knives and razors.

37. Elliot, Joseph, 4 *Holles Croft, Sheffield.*—Manufacturer.
Several varieties of fine razors.

[Sheffield has been noted for its cutlery as far back as the thirteenth century; its celebrity for the manufacture of razors is world wide. The best razors are of the finest and hardest cast steel; the tempering is performed by placing them on the open fire, in a sand bath, being removed the moment they assume a deep straw color—or in an oil bath, or a bath of fusible metal of 8 parts bismuth, 5 parts lead, and 3 parts tin, heated to 500° Fahr. A *maker* and a *striker* work with alternate strokes and different-sized hammers; the rod of steel of which they are made is about half an inch broad and of thickness sufficient to form the back; the anvil on which they are forged is a little rounded at the sides, which gives greater facility in thinning the edges and in making the blade a little concave. These operations, as well as the grinding, require to be skillfully done; for the want of the requisite skill many high-priced razors are very defective. Razors are ground crosswise upon stones from four to seven inches in diameter, revolving in water; glazing is performed by a wooden disc; polishing is performed by a wooden wheel, having its circumference covered with buff leather, which is covered with crocus, an impure oxide of iron. The number of men employed at the anvil in razor-making at Sheffield is about 200.]

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38. Hargreaves, William, & Co., *Sheffield.*—Manufacturers.
Table knives, with highly polished blades, and mounted in richly carved ivory, in a beautiful case made of East Indian Coromandel wood; dessert knives, in silver, pearl, and richly carved ivory; a variety of table cutlery, carvers, game carvers, and beef slicers; fine scissors, razors, and spring knives, edge-tools, and saws of best cast steel; joiners' tools.

[Some idea of the extent of the Sheffield manufacture of table cutlery may be obtained from the fact that the amount of ivory cut up by the "hafters," or handle makers, is about seventy tons annually, being nearly one-fourth of the whole amount imported into England. The number of men employed in forging blades at the anvil is about 700; of grinders, including boys, 900; and of hafters, 1,300.

The value of the materials of horn, pearl, tortoise shell, and ivory, used in Sheffield for the handles of pocket cutlery, is £100,000 annually.

It has been said that a pair of plain, well-formed, and perfectly polished lady's scissors is the most elegant production of the Sheffield workshop; and an article which completely defies all foreign competition, both for exquisite finish and effective action. About 900 males and 200 females are employed in the manufacture of scissors.

The number of persons employed in Sheffield in the spring-knife cutlery department is about as follows: blade, scale, and spring forgers about 275; grinders, 500; men and boys at workboard, 2,500.]

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39. Marples, William, *Sheffield.*—Manufacturer.
A variety of joiners' tools, augers, bits, chisels, gouges, &c.

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40. Turton, Thomas, & Sons, *Sheaf Works, Sheffield.*—Manufacturers.
A variety of axes, adzes, chisels, and drawing knives.

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41. Sellers, John, *Sheffield.*—Manufacturer.
Various kinds of pocket cutlery, razors, sportsmen's and gardeners' knives; surgical instruments.

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42. Bingham, Charles Thomas, *Tally Ho Works, Sheffield.*—Manufacturer.
A variety of razors.

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43. Turner, T., & Co., *Suffolk Works, Sheffield.*—Manufacturers.
A great variety of fine table and pocket cutlery; razors; long, round, and hand saws; files; engravers' burins; colossal knife and fork, with handles of stag's horns of the natural size and appearance; pruning knives in sets; silver fish knife; kitchen cutlery in great variety.

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44. Howarth, James, *Sheffield.*—Manufacturer.
Edge-tools; engravers', joiners', gunsmiths', carvers', and other light tools; gardeners' portable box of instruments.

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45. Jackson, William, & Co., *Sheaf Island Works, Sheffield.*—Manufacturers.
Steel saws, razors, shears, daggers, pocket knives, chisels, bits, and other edge-tools; table cutlery; files; specimens of cast steel.

[About 500 persons are constantly employed in Sheffield in the manufacture of saws.]

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46. Butler, George, & Co., *Trinity Works, Sheffield.*—Manufacturers.
Samples of fine pocket cutlery; a many-bladed knife.

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47. Groves, Richard, & Sons, *Sheffield.*—Manufacturers.
A variety of saws, files, chisels, bits, edge-tools, and specimens of cast steel of fine quality.

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48. Marsh, Brothers, *Pond Works, Sheffield.*—Manufacturers.
Table cutlery, fine razors, carvers, pocket cutlery, chisels, saws, adzes, shears, scissors, bits, daggers, silver fish knives, and specimens of cast steel.

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49. Heiffer, John, *Sheffield.*—Manufacturer.
Fine so-called army and navy razors.

BRITISH COLONIES.—CANADA.

50. Leavitt, G., *Dundas, Canada West.*—Manufacturer.
Specimens of fine cast steel felling axes.

FRANCE.

51. Sommelet, Danton, & Co., *Nogent, near Paris.*—Manufacturers.
Scissors of various descriptions and qualities.

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52. Massa & Son, 7 *Rue de la Monnaie, Paris.*—Manufacturers.
Samples of new styles of fine cutlery.

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53. Parod, A., 95 *Faubourg St. Martin, Paris.*—Manufacturer.
Various gardening tools and vegetable knives

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54. Coulaux & Co., *Molsheim, Bas Rhin.*—Manufacturers.
Hatchets, knives, scissors, drawing knives, saws, adzes, and chisels.

THE GERMAN STATES.

55. Levy, Hermann, *Dresden, Saxony.*—Manufacturer.
An assortment of table knives and shears.

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56. Dittmar, Brothers, *Heilbronn, Wurtemberg.*—Manufacturers
Patent razors and razor strops; a variety of lancets and scarificators, and other articles of cutlery.

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57. Lohnmann, F. W. & F., *Voerde, Westphalia.*—Manufacturers.
Swords, cleavers, hatchets, knives, and other cutlery in great variety.

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58. Henchkels, J. A., *Berlin and Solingen, Prussia.*—Manufacturers.
Specimens of cutlery, manufactured from the refined steel of the Siegen Smelting Works—table and pocket cutlery, scissors and shears, swords and daggers, in great variety.

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59. Bleckmann, J. E., *Ronsdorf, Hesse Cassel.*—Manufacturer.
A variety of edge-tools and cutlery; knives, scissors, table and pocket cutlery, saws, and axes.

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60. Schmidt & Möllenhoff, *Hagen.*—Manufacturers.
Fine cutlery and edge-tools.

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61. Gerresheim & Huff, *Solingen, Prussia.*—Manufacturers.
Scissors in great variety.

THE AUSTRIAN EMPIRE.

[The cutlery from Austria is of the cheapest and most ordinary description; the specimens exhibited by each manufacturer are so few, and each collection so much resembles every other, that they are here catalogued together according to the particular article exhibited by the manufacturers.]

62. Specimens of *razors* are exhibited by:

Nagel, Bernhard, *Waidhofen, Austria Proper.*
Schnabel, Leopold, " "
Wachter, L., *Stadt Steyr,* "
Bley, J., " "
Rupprecht, S., " "
Bresselmaier, J., " "
Ruprecht, Regina, *Waidhofen,* "

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63. Specimens of *scissors* are exhibited by:

Wendel, John, *Waidhofen, Austria Proper.*
Gampmayer, Mathias, " "
Pletzer, Martin, " "
Aigner, Joseph, " "

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64. Specimens of common *pocket or table cutlery* are exhibited by:

Schnabel, Mathias, *Waidhofen, Austria Proper.*

SCHNABEL, JOSEPH, *Waidhofen*, *Austria Proper*
STIERHOFER, A., *Stadt Steyr*, "
PFUSTERSHMIDT, J., *Neuzeng*, "
DOPPLER, A., *Sierninghofen*, "
LOESCHENKOHL, C., *Stadt Steyr*, "
OSTERBERGER, L., " "
FROELICH, J., *Steinbach*, "
FROELICH, C., " "
MOSER, F., " "
MOSER, ANTON, JR., " "
MOSER, CHARLES, " "
LOESCHENKOHL, J., " "
SCHWINGHAMMER, S. T., " "
RESSL, J., " "
MOSER, JOHN, *Sierninghofen*, "
MOSER, G., " "
MOSER, ANTON, SEN., " "
WEICHSELBAUMER, M., " "
TRENKNER, A., " "
SABZWIMMER, P., " "
HELM, A., " "
HOFER, P., " "
PILSS, C., " "
HAINDL, A., " "
KERBLER, J., " "
FORSTER, L., *Neuzeng*, " "
PILSS, F., " " "
RIEDLER, J., " " "
PILSS, M., " " "
DERNBERGER, F., *Grünburg*, " "
DANCHER, S., *Untergrünburg*, " "
PILSS, G., *Stadt Steyr*, "
RIEDLER, L., " "
LEIDER, F., " "
STUCKHART, J., " "
LICHTL, J., " "

ALSTERBERGER, J., *Stadt Steyr*, *Austria Proper.*
WEICHSELBAUMER, J., " "
MITTER, JOSEPH, SEN., " "
MITTER, JOSEPH, JR., " "

65. Specimens of *awls* are exhibited by:

BERGER, AUGUST, *Waidhofen*, *Austria Proper.*
DERFLER, J., *Stadt Steyr*, "
KETTENHUBER, J., " "
KOLM, JOHN, " "
BUCHBERGER, J., " "
MOLTERER, C., " "
MOLTERER, V., " "
MOLTERER, G., " "

66. Specimens of *gimlets and augers* are exhibited by:

HAUSER, J., *Stadt Steyr*, *Austria Proper.*
METZ, G., "
WEISSENHOFFER, RUDOLPH, *Waidhofen*, *Austria Proper.*

67. STOPINGER, JOSEPH, *Waidhofen*, *Austria Proper.*—Manufacturers.
Samples of saws.

68. TEUFLMAYER, J., *Stadt Steyr.*—Manufacturer.
A horse lancet.

SWITZERLAND.

69. LECOUTRE, C. A., *Brassus*, *Canton Vaud.*—Manufacturer.
A variety of fine razers, and gravers for watchmakers.

70. LECOUTRE, JACQUES, *Sentier*, *Canton Vaud.*—Manufacturer.
Various specimens of fine razers, and gravers for watchmakers.

SECTION III. CLASS XXII.

IRON, BRASS, AND GENERAL HARDWARE.

This class embraces some of the most important, as well as some of the most trifling objects in the Exhibition; in it is comprised the manufacture of iron, brass, general hardware, and the common utensils of every-day life.

The specimens of American bar and cast steel, and of cast and wrought iron, give promise of great results as soon as improved processes of smelting and conversion, suitable to our ores, shall be adopted. The safes, locks, tools, table and culinary hardware, bells, and various articles in iron, brass, and zinc, give evidence of remarkable adaptation to the utilitarian spirit of the age, without much apparent regard to ornament.

The specimens of iron and steel manufactures, of files, chains, general hardware, pins and needles, sustain the high reputation England has long enjoyed in these branches of industry.

From the Zollverein are sent fine specimens of iron, steel, lead, and zinc; general hardware, steel articles, bronze and zinc castings and ornaments, wire, pins, and needles;—from Belgium, sheet iron and zinc, nails, and fancy articles in bronze;—from France, sheet brass, zinc, copper, and German silver; iron furniture and garden ornaments, tools, locks, blacksmiths' apparatus, metallic gauzes, culinary apparatus, and zinc castings;—from the Netherlands, fine castings in iron and zinc, for utility and ornament, and bells;—from Austria, a great variety of common hardware and steel articles;—and from Sweden, specimens of her unrivaled iron and steel.

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1. Abbott, H., *Baltimore, Maryland.*—Manufacturer.

Boiler-plate iron; locomotive-boiler iron; boiler-head, 92 inches in diameter.

[The ores generally used in the manufacture of iron are commonly the earthy oxyds; as the fusing of these would produce a kind of glass, it is necessary to mix the ore with some substance which shall combine with the oxygen and earthy matters, and set the metal free; for this purpose, charcoal and carbonaceous substances are used; some flux, as lime, is also generally added to facilitate the fusion. The reducing of the ore is performed in a blast or smelting furnace, after having been previously roasted, to drive off the water, sulphur, and arsenic. An ordinary furnace will make about four tons of cast-iron in twelve hours, for the production of which quantity of metal are required about eight tons of the iron-stone, seven tons of coke, and three tons of lime, as a flux; some large furnaces will receive double this amount in the same time. In order to secure a sufficient heat, it is necessary to force into the furnace a blast of air, which is effected by machinery; in 1824, Mr. Neilson, of Glasgow, substituted the *hot* blast for the *cold*, which has proved to be the most valuable and economical of the modern improvements in the iron manufacture.

The smelted iron is allowed to run off into a channel made in sand; from this channel, called the *sow*, are led numerous side-branches, called *pigs*, into which it is directed by the workmen; hence the term, *pig-iron*. From pig-iron, it is converted into bars of malleable iron, by *refining* and *puddling*. For the first process, the metal is kept in a state of fusion for two or three hours, exposed to an intense heat, produced by a strong blast; it is then run out into a flat mould, where it speedily cools into a bright, brittle state. When cold, it is broken into pieces, and placed in the *puddling*, or reverberatory furnace, the object of which is to deprive the metal more thoroughly of its carbon, which passes off as carbonic oxyd; the metal becomes thicker, until it assumes a sandy appearance, when the heat is raised, and it forms into lumps. The puddler then forms the mass into balls, weighing about eighty pounds, which are technically called *blooms;* these are subjected to blows from a heavy hammer, or to great pressure in a machine, which gives them a more compact and convenient shape. After this, the iron is passed through rollers, which form it into an elastic bar of *malleable* iron.

The compactness of structure and fineness of grain which characterize the Swedish iron, are evidently due, in a great measure, to the employment of *charcoal* in its manufacture; iron made by *coke* or *coal* presents a rough grain and a crystalline structure. The discovery is yet to be made of some mode of preventing the crystallization of iron, analogous to the mysterious process, known as *polling*, which changes copper from a highly crystalline mass, incapable of being rolled or hammered into plates, into a copper which may be beaten into thin leaves. Splendid fibrous iron is occasionally made by accident, but this accident depends on fixed laws, which it would largely repay any one to discover; and the secret, when found, will doubtless be a very simple one, like all the other operations of great natural laws.

The amount of iron produced in the United States is estimated at 800,000 tons annually, employing about 250,000 persons; in addition to this, about 300,000 tons of imported iron are annually consumed; one-third of all the iron manufactured in the United States is produced in Pennsylvania.]

1a. Churchman & Roberts, *New York City.*—Manufacturers.

Boiler-plate iron.

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2. Ripley, Philip, & Co., *Hartford, Connecticut.*—Manufacturers.

Cast spring and bar steel, in bars and bundles; nail-rods; shoe-shapes; scroll and nut iron.

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3. Ibbotson, S. F., 218 *Pearl Street, New York City.*—Manufacturer and Agent.

A variety of fine American cast-steel in bars.

[Steel is a compound of iron and carbon; their proportions vary in different qualities of steel; in ordinary steel, the carbon rarely exceeds two per cent., and is generally below it; the purest iron makes the best steel. Three varieties of steel are generally manufactured here: *bar* or *blistered* steel, *shear* steel, and *cast* steel.

Bar steel is made by a process called *cementation*, which consists in placing bars of the purest malleable iron in alternate layers, with powdered charcoal, in a proper furnace; air is carefully excluded, and the whole kept at a red heat for several days. By this process, carbon combines with the iron, and alters its texture from fibrous to granular crystalline; in these furnaces, twelve tons of bar-iron may be converted into steel at each charge. This has been called *blistered* steel, from the air-bubbles which cover its surface, derived apparently from the formation of carbonic oxyd during the process of cementation. The action of the carbon causes cavities and fissures, which render the steel unfit for use until it has undergone the operation of *tilting*, which is performed by beating it under tilt-hammers, weighing usually 200 cwt., until it acquires a very uniform structure.

Shear steel is made by binding together several bars of blistered-steel, by means of a steel rod, and heating them to a welding heat, the surface being covered with sand or clay to prevent oxydation; it is then drawn out into a bar, by means of a

tilt-hammer, and rolled. In this state, it is more tenacious and malleable, and susceptible of a finer polish.

Cast steel is made by melting blistered steel, broken into small pieces, in fire-clay crucibles, closely covered, by means of a coke fire; it is then cast into "ingots," and rolled into bars. In this condition, it has a much more close, fine-grained, and uniform texture. *Sheet* steel is made by being rolled between revolving cylinders.

Damascus steel is made directly from the iron ore, principally a red oxyde of iron. *Wootz* is the name given to the steel, the most ancient known, derived from India, celebrated for the toughness and durability of the cutting edges made from it; it is made from magnetic iron ore, such as is found in abundance in New York, New Jersey, and Pennsylvania. It is highly probable that the genuine Damascus blades were made from "wootz;" the imitation blades, of modern make, though they have a damasked appearance, have none of the superior qualities of the true Damascus swords. It has been said that the peculiarities of this steel depend on the presence of a small quantity of aluminum; but this is by no means settled.

German steel derives its name from the manner in which it is manufactured; it is made of pig or white-plate iron, in forges where charcoal is used for fuel; to this last, and to the character of the ore (bog-iron, or the sparry carbonate), its properties may be attributed.

The most important element in making steel is the iron ore; bog-ore, impure hematites, impure magnetic and sparry ores, will make steel, but at great expense, and of an inferior quality. According to Mr. Overman, the only iron ores in this country, which can be profitably used for the manufacture of natural steel, are the ore of the Missouri iron-mountain, the recently discovered deposits near Lake Superior, and the specular ores of Pennsylvania and New Jersey; either carbonates or peroxyds of iron. A low heat, an abundance of coal (well charred pine charcoal is the best), and good ore, will produce good steel; and in no other way can it be produced. The analysis of different kinds of steel shows that it may contain, besides iron and carbon, sulphur, phosphorus, silica, arsenic, antimony, copper, tin, manganese, calcium, minute quantities of any of which may impart peculiar properties; if iron ore, however, contain more than the 2000th part of any of these, except carbon, it will not make first-rate steel. Many attempts have been made to make cast-steel directly from the iron, without resorting to the converting process into blistered-steel, but without success.]

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4. Reading Iron Nail, Tube, and Boiler-flue Works, *Reading, Pennsylvania.*—Manufacturer. Office, 9 *Platt Street, New York City.*

Lap-welded iron boiler-flue.

4a. Lord, George W., & Co., *New York City.*—Manufacturers.

Two pieces of hammered iron.

4b. Morris, Tasker & Morris, *Philadelphia, Pennsylvania.*—Manufacturers.

Wrought-iron steam and gas pipes, boiler-flues, tools, and fittings.

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5. Werner, Carl, *Charleston, South Carolina.*—Manufacturer.

Model of a palmetto-tree, cast in iron.

5a. Wood, Allen, *Philadelphia, Pennsylvania.*—Manufacturer.

Imitation Russia sheet-iron.

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6. Richardson, Barnum & Co., *Lime Rock, Connecticut.*—Manufacturers.

Cast-iron car-wheels; railroad frogs.

6a. Lovegrove, T. J., *Baltimore, Maryland.*—Patentee and Manufacturer.

Cast-iron pipes for water, gas and Artesian wells, and centrifugal columns. These pipes are cast by a peculiar process, without cores.

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7. Stearns & Marvin, 146 *Water Street, New York City.*—Manufacturers.

Wilder's patent salamander safes, with Rich's improvement for preventing dampness.

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8. Bates, Griffin & McChesney, *Troy, New York.*—Manufacturers.

Lillie's impenetrable fire-proof safe; burglar-proof bank-safe; patent vault doors and frames for banks.

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9. Sherwood & Fitzgerald, *New York City.*—Manufacturers.

An "invulnerable reservoir" safe.

9a. Evans & Watson, *Philadelphia, Pennsylvania.*—Patentees and Manufacturers.

Patent fire and thief-proof safes; improved refrigerators.

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10. Herring, Silas C., *Water Street, New York City.*—Inventor and Manufacturer.

Patent fire-proof salamander safes; burglar-proof safes—highly ornamented with inlaid work; bank and safe locks.

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11. Patrick, R. M., 192 *Pearl Street, New York City.*—Manufacturer and Proprietor.

Defiance salamander safes (Gayler's patent); original double-flange and fire-proof safes, free from dampness—provided with Geffin's "defiance" lock, and cross-bar or key-hole protector. This lock is not liable to get out of order, and is proof against burglars; the key weighs less than an ounce, and is only required to unlock it; the cross-bar is fastened from the inside of the door, protecting the key-hole, without projecting beyond the outer surface of the safe.

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12. Holmes & Butler, 122 *Water Street, New York City.*—Proprietors and Manufacturers.

Improved phœnix safes, lined with composition to resist heat. Powder-proof permutation bank and safe locks (patent of T. P. Murphy's), the key capable of millions of changes.

[Fire-proof safes are made of strong wrought-iron, lined with hard-steel plates, the interval between the two being filled with some non-conductor of heat, so that the inner wall may not become incandescent; from the conducting powers of iron, the contents of the safe would be soon charred, unless some non-conducting substance intervened between the outer and the inner plate. This non-conducting substance may be plaster-of-paris, clay, or chemical salts, which resist the action of intense heat, and which, in the act of fusion or liquefaction, absorb great quantities of heat. These safes have resisted the most intense heat of burning stores, with perfect security to most valuable contents; the one exhibited by Sherwood & Fitzgerald was tested by the jury, and found to withstand the intense heat of a pine-wood and coke fire for twenty-four hours, and came out from the fiery ordeal with its contents of books and papers not materially injured; showing itself proof against a heat far greater than it could be called upon to bear in an ordinary conflagration.]

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13. Mackrell & Richardson, 292 *Houston Street, New York City.*—Manufacturers.

Samples of locks, cast-iron butts, pulleys, hinges, &c.

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14. Butterworth, J. H., *Dover, New Jersey.*—Manufacturer.

Burglar and powder-proof combination bank-lock.

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15. Yale, Linus, Jr., *Newport, New York.*—Inventor and Manufacturer.

Patent magic locks.

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16. Barratt, John B., 107 *Gold Street, New York City.*—Manufacturer.

Bramah patent lever-locks of every description.

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17. Lewis Lock Company, *Terryville, Connecticut.*—Manufacturers.

Cabinet-locks of all descriptions.

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18. Day & Newell, 589 *Broadway, New York City.*—Manufacturers.

Specimens of bank-locks, and all kinds of door-fastenings. The workmanship of the parautoptic lock, by John McLaughlin.

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19. Fitch, W. & E. T., *New Haven, Connecticut.*—Manufacturers.

A general assortment of cabinet-locks.

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20. Nock, Joseph, 34 *Walnut Street, Philadelphia, Pennsylvania.*—Patentee and Manufacturer.

Nock's patent self-acting locks and bolts; model of double-doors, with locks attached.

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21. Stivers, Arnold, *Newark, New Jersey.*—Manufacturer.

House and store-door locks, hinges, and bolts; coach-door and blind fastenings; silver-plated bands and handles.

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22. American Alarm Lock Company, 251 *Broadway, New York City*—Manufacturers.

Electric alarm-lock, invented by Charles Fleischel.

[The principle on which all locks depend is, the application of a lever to an interior bolt, by means of a key of some kind; so that the more impediments are placed between the key and the bolt, the more secure is the lock; such impediments were called *wards*, which have been made in great numbers, and of much intricacy. It was soon found that locks with fixed wards offered no protection against a skillful burglar, from the facility with which an impression could be taken of them with wax, for the fabrication of a false key. *Tumblers* were afterwards introduced into locks; a tumbler is a kind of latch, which, by means of a spring, detains the shot-bolt in its place until a key lifts it, and leaves the bolt at liberty—the principle is the same, whatever may be their number or shape. The principle of *Bramah's* lock consists in a complicated arrangement of slides, which, by falling into notches in a shot-bolt, detain it in that position until they are removed; each slide having a motion of its own, and each being able to retain the bolt, the security was thought to be very great. Mr. *Chubb* introduced what he called a "detector;" the improved *Chubb* lock consists of six distinct double-acting tumblers, each of which must be lifted to the proper fixed position before the slot of the bolt can pass. As there is no way of knowing the precise lift of any of these tumblers, and very little chance of hitting by accident the required lift of them all combined, this lock was safer than those with fewer tumblers. The "detector" enables the owner to detect any attempt to open the lock by a wrong key, for, if a tumbler is lifted out of its proper place, the spring of the detector catches and holds it in that position, which is known by the failure of action of the right key, a backward turn of which is sufficient to release the tumbler, and allow the passage of the bolt. The changes which may be introduced in these tumblers are very great, and add still further to the security of the locks.

These English locks were supposed to be secure against the attempts of false keys, from the impossibility of obtaining any knowledge of the construction of the lock through the key-hole; in order to secure them against the maker, or any one who might have taken an impression of the true key, locks were constructed so that the internal arrangement could be changed at the pleasure of the owner.

Locks were made by Mr. Andrews, of Perth Amboy, New Jersey, similar to those of Mr. Chubb, with a detector; the tumblers can be arranged in any manner, and the key can be made to suit them by a series of movable bits with which it is made; this lock was in great repute, and was supposed impregnable.

Mr. Newell (of the firm of Newell & Day) improved upon this lock, by making what he called his "permutating" lock, which was composed of a series of first and secondary tumblers, the secondary being acted upon by the first series—a clamp-screw passed through the secondary series, the head of which rested in a small round key-hole on the back-side of the lock; so that when the large key gave the form to the tumblers, it was necessary to act on the secondary series by the small key, retaining them at the relative heights given to them by the large key. The objection to this lock was, that if the clamp-screw was not released every time the lock was unlocked, the first series of tumblers would be upheld by the second, and permit an exact impression of the lengths of the several bits of the key to be obtained through the key-hole, while the lock was unlocked. He afterwards improved upon this lock, by means of a lever pendent from the bolt, by the tooth of which the secondary series is held in position, thus avoiding the necessity of a second key. Mr. Newell first picked the lock of Mr. Andrews, and then picked his own, by a very simple instrument, so that no improvement had actually been made in the safety of the lock against picking; an addition of complicated wards did not remedy the difficulty, as what could be reached by a key, could be reached by another instrument. The next step was, to notch the abutting parts of the first and secondary series of tumblers, or of the stump-face and the ends of the tumblers; this lock was picked, and Mr. Newell was convinced that the only safe way was to make a lock so that the obstructions to the withdrawing of the bolt could not be ascertained through the key-hole. With this object in view, he invented the "parautoptic" lock, the most novel feature of which is, that it changes itself to the key; in whatever form the movable bits are arranged, the lock answers to it. If a six-tumbler lock, it may be changed 720 times; if seven tumblers, 5040; if eight, 40,320; if nine, 362,880; if ten, 3,628,800; if twelve, 479,001,600 times—thus, by changing the bits of the key, this number of new locks may be obtained. In this lock, a third, or intermediate series of tumblers is introduced, throwing the whole security of the lock into a chamber separated from the key-chamber, by a wall of metal, which is completely inaccessible, being, in fact, another lock, without a key-hole. At present, this lock defies all means of opening by false keys, or forcing by gunpowder.

Permutation-locks have also been made with a series of rotating discs or plates, unaided by springs or tumblers, which may be changed millions of times, at the pleasure of the owner; thus rendering useless any knowledge previously obtained of the arrangement of the lock, and rendering it almost impossible to pick or force it.]

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23. Atlantic Railway Works, *Office*, 398 *Broadway, New York City.*—Manufacturer.
Iron railing around the equestrian statue of Washington and Carew's statue of Daniel Webster.

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24. Wickersham, J. B., *New York City.*—Manufacturer.
Iron railing around the galleries and staircases of the Crystal Palace.

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25. Hooper, Thacher & Co., 382 *Broadway, New York City.*—Manufacturers.
Iron railing surrounding the statuary of Thorwaldsen.

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26. American Horse-nail Company, *Providence, Rhode Island.*—Manufacturers.
Improved nails for horse-shoeing.

[Nails, in this country, are mostly machine-made; by the nail-cutting machine, they can be made for one-third the cost of wrought nails, to which they are superior, unless it is necessary to clinch them, as in horse-shoeing. After being rolled into plates, the iron is slit into rods, and flattened by a second rolling to the thickness of the future nail; the machine cuts off at every stroke a wedge-shaped piece, which is instantly caught by a pair of grips, while a blow from a hammer, or strong pressure, spreads the metal so as to form the head. Cut nails are preferred to hammered nails by most persons, on account of their sharp corners and true taper, and the facility with which they may be driven without the danger of splitting the wood, the nail one way being the same breadth from head to point.]

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27. Wright, William, & Co., *Newark, New Jersey.*—Manufacturers.
Railway-car, carriage, and cart springs.

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28. Gatedell & Gates, *Newark, New Jersey.*—Manufacturers.
Steel carriage and cart springs, of various patterns.

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29. New England Butt Company, *Providence, Rhode Island.*—Manufacturers.
Cast-iron butt-hinges, gate-hinges, sad-irons, foot-scrapers, and barn-door rollers.

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30. Russell, Birdsall & Ward, *Port Chester, New York.*—Manufacturers.
Iron bolts, of all descriptions; screws and rivets; stove, range, and furnace rods; iron-revolving Venetian window-blinds, fire and burglar proof.

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31. Evans, Henry, 102 *Warren Street, New York City.*—Manufacturer.
Samples of iron bolts and nuts.

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32. Union Butt Company, *Providence, Rhode Island.*—Manufacturers. (Agent, Thomas Douglass, 5 *Platt Street, New York City.*)
Samples of cast-iron butt-hinges.

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33. Soverel, Matthias, *Orange, New Jersey.*—Proprietor.
Carriage-shaft safety-bolt, to fasten a pair of shafts to a carriage.

[This method is safer than the usual one, as there is no nut to be lost, or key required; it is more convenient, as no wrench is required in changing from shaft to pole, and vice versâ, it being only necessary to pull back the bolt, which is kept in place by a brass spiral spring.]

33a. Spratt, James, *Cincinnati, Ohio.*—Inventor and Patentee.
Reproducing points, for lightning-rods; unoxydating metallic alloy-point for ditto.

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34. Cole, George H., 129 *Amos Street, New York City.*—Manufacturer.
A variety of tools for cabinet and piano-forte makers, and for sculptors.

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35. Tollner, Charles, 521 *Bowery, New York City.*—Manufacturer.
Case of tools for piano-forte makers.

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36. New England Screw Company, *Providence, Rhode Island.*—Manufacturers.
Gimlet and pattern screws.

[Screws are made from iron wire; the head is raised in a die by pressure, flattened and slit by a small revolving circular-saw; threading is effected by a screw which traverses the back of the spindle, and forces the blank iron against small cutters which groove out the thread; three runnings down suffice for making an ordinary-sized screw; the shape of the cutters regulates the fineness of the thread.]

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37. Switzer, Keyser & Co., *Basil, Ohio.*—Manufacturers and Proprietors.
Patent self-holding screw-driver.

[It is easy of application, and saves much time and labor; it is inclosed in a tube in which it revolves, and the screw requires no guidance.]

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38. Ducreux, C., 384 *Broadway, New York City.*—Manufacturer.
Screws for machinists and artisans; French and mechanical lamps, of the most modern construction; specimens of the works in case.

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39. Hawks, Loomis & Co., *North Bennington, Vermont.*—Manufacturers.
Steel squares for carpenters' use.

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40. Loew, Joseph, 176 *Third Street, New York City.*—Manufacturer.
Steel dies for knife handles and breast-pins.

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41. Reed, Franklin, *Canton, Massachusetts.*—Manufacturer.
Assortment of tools for shoemakers and gardeners.

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42. Ruggles, Nourse & Mason, *Boston and Worcester, Massachusetts.*—Proprietors.
A variety of horticultural cutting instruments.

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43. Bowden, John, 313 *and* 315 *Stanton Street, New York City.*—Manufacturer.
Ornamental grate frames and summer pieces.

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44. Ross & Wilcox, *East Berlin, Connecticut.*—Manufacturers.
Machines and tools for tin-workers; polished anvil, beak iron, swage, planished-faced hammers, which are in daily use.

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45. Boyd & Keen, 11 *Gold Street, New York City.*—Manufacturers and Agents.
Steel fire-sets; coach wrenches; iron brace bit-stocks; warranted grindstones, with iron caps; jack-screws and other hardware; Stebbins' water-cocks.

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46. Nelson, Henry, 107 *East 32d Street, New York City.*—Manufacturer.
Steel hammers and sledges in great variety and of high finish; horse-shoes.

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47. Royer & Brothers, *Philadelphia, Pennsylvania.*—Manufacturers.
Seal and stamping presses.

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48. Blodgett, Clark & Brown, *Boston, Massachusetts.*—Manufacturers and Agents.
A variety of Bisbee's brick, pointing, and plastering trowels; Watt's levels; wrenches.

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49. Butler, William, *Little Falls, New York.*—Inventor, Patentee, and Manufacturer.
New and improved vice for carpenters and machinists.

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50. Ibbotson, Henry J., & Co., 218 *Pearl Street, New York City.*—Manufacturers.
A great variety of fine files and rasps; square, round, flat, triangular, semicircular, rat-tailed, and curved.

[Files are of the first importance to every worker in metal, from the engine-builder to the maker of the most delicate watch movement; they require great skill in hardening to prevent their warping. Small files are made of the best cast-steel, those of larger size from ordinary steel; they are cut by hand, no machine having yet been invented which can compare with the human hand for the delicacy and accuracy of the teeth it cuts; the instrument used in making the "cuts" is a straight-edged chisel, acted upon by a hammer. Machine-made files are deficient in their "bite." The different forms of the file require variously shaped surfaces on which to forge them.]

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51. Hotchkiss, A. A., & Sons, *Sharon, Connecticut.*—Manufacturers.
Specimens of patent curry-combs, bow-pins, hammer-wrenches, and snaps.

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52. Timpson, C. B., 126 *Cherry Street, New York City.*—Manufacturer.
Hardware for ships and steamboats; furnishing tools and brass castings.

53. Maydole, David, *Norwich, New York.*—Manufacturer.
A great variety of highly finished hammers.

54. Wyckoff, T. V. D., 152 *Broadway, New York City.*—Importer.
A miscellaneous assortment of table and hardware; table and pocket cutlery; table pressure bells; Prince Albert skates; bits; Chubb's, Bramah, Barron's alphabetical and book locks.

55. Phineas, Myer, 118 *William Street, New York City.*—Manufacturer.
Various styles of steel pens, pen-holders, and seals.

56. Raymond, William M., & Co., 536 *Broadway, New York City.*—Manufacturers.
Fisk's Patent Metallic Burial Cases, covered with black velvet, with silver mountings.

[These cases being of metal are imperishable, impermeable to water, and air-tight; these advantages are sufficient to secure a general adoption.]

57. Webb, William, *Allen Street, New York City.*—Manufacturer.
Candle moulds in composition metal.

58. Cragin, G., *Brooklyn, New York.*—Agent for Oneida Community.
Steel rat-traps.

58A. Gould, Jason, *Albany, New York.*—Inventor and Proprietor.
Gravitating trap.

58B. Connelly, Edward, *Indianapolis, Indiana.*—Inventor.
Rat-trap and gravitating bolt sash-lock.

59. Beaman, William F., *Buffalo, New York.*—Manufacturer.
Hydrostatic portable furnace-table for glass-workers, opticians, and other machinists; bellows of all descriptions, for artisans, manufacturing dentists, housekeepers, &c.

60. McCready, H. R., 15 *John Street, New York City.*—Manufacturer.
Steel piano wire, gilded; preventing rust.

61. Steele & Johnson Manufacturing Company, *Waterbury, Connecticut.*—Manufacturers.
Specimens of metal, gilt, and fancy buttons, in great variety.

[Metal buttons are made of flat circular discs cut out of rolled metal; the eyes, made of wire bent by machinery, are attached by soldering; the designs are raised on them by means of a steel die, sunk in intaglio, into which the metal is forced by a reverse stamp. Common four-holed brace-buttons are cut out and pierced by means of the press. In the old process of gilding, the gold is reduced to an amalgam by means of mercury, which readily unites with the gold; the buttons are placed in a pan with some of the amalgam, and sufficient nitric acid sprinkled upon them to remove any extra oxydation; the acid, and lastly the amalgam, is diffused over the metal to be gilt, and the fumes of the mercury are evaporated by heat.]

62. Cook, Edward, 127 *Pearl Street, New York City.*—Agent for American Pin Company, *Waterbury, Connecticut*, and Howe Manufacturing Company, *Birmingham, Connecticut.*
Specimens of pins, hooks, and eyes.

[Pins are made of brass wire, reduced by the usual process of wire-drawing; the wire is straightened by being drawn through a number of studs on the straightening bench; it is then cut into lengths sufficient to make two pins, thirty or forty of the lengths being taken up at once and pointed by small revolving steel wheels; the heading is performed, very much as mentioned in nail-making, by a horizontal hammer or by machine pressure; whitening is performed by boiling in a solution of cream of tartar and tin. Pins are now made with solid heads.

The Howe Manufacturing Company, at Birmingham, Connecticut, was established in 1835, by Mr. John J. Howe. The pins are "solid-headed," consisting of a single piece of metal, as distinguished from the "spun-head" pins, in which the head is formed from a separate coil of wire, fastened on the shank by pressure between dies.

The "needle-pointed" pins are of unexceptionable quality; their sizes are distinguished by the marks, S. C.; F. 3½; B. B. & S. W. The more common pins are numbered in sizes from one to eight, number one being the largest, the smallest being used for putting up ribbons and other small wares.

Besides pins for common purposes, the Company manufacture pins with flattened ends instead of heads, which are used in the manufacture of muslins and similar fabrics; also short stout pins, used in blocking and preparing straw bonnets; these have become a regular article of trade. They were the first manufacturers of the "solid-headed" pins in this country, in the year 1838, prior to which time they were hardly known here, and not in common use in England.

In their establishment machinery has been substituted for the manual operations of the old process; by this the wire is drawn in, cut, formed into a finished pin, and discharged into a receiver, without the aid of the hand.

In the old "spun-head" pin there was always a great waste and inconvenience, arising from the slipping down of the head on the shank, on the pressure necessary to force it into an article of clothing; the "solid-headed" pin is free from this loss and inconvenience, reduces the relative amount of pins used, and also can be furnished, weight for weight, twenty-five or thirty-three per cent. cheaper than the old pins, prior to its introduction. There is also an important reduction in the quantity of metal consumed in the manufacture of the "solid-headed" pin. When it is considered that from eight to ten tons of copper and zinc are consumed weekly in the United States in the manufacture of pins, none of which ever gets into the melting-pot again, it will be seen that the total waste of these metals throughout the world is very great, and that any improvement by which one quarter of this waste can be saved in this small article is of importance.]

63. Cabble, William, 63 *Elizabeth Street, New York City.*—Manufacturer.
Specimens of composition wire for weaving wire-cloth, for Fourdrinier Paper-Machines, and for the manufacture of musical instruments.

[In making wire, iron rods are drawn through steel draw-plates, with holes drilled in them of different degrees of fineness; such is the perfection of the machinery, that two minutes suffice to convert the rod into a fine wire. The art of wire-drawing of the finest sizes seems to have been first effected at Nuremberg in 1570, and very fine specimens are exhibited in the German department of the Exhibition; gold and silver wires were first made there in 1592, by Hagelsheimer, who probably brought the art from Italy. The finest wires are still made on the continent of Europe, often of sizes nearly as small as human hair.]

64. New England Buckle Company, *Waterbury, Connecticut.*—Manufacturers.
Specimens of buckles for vests, pantaloons, and hats.

65. Torrey, James D., 82 *John Street, New York City.*—Manufacturer.
Wire frames, or figures, for displaying garments, hats, caps, &c.; wire bird-cages, baskets, and tables.

66. Schmidt, C. & G. F., *Philadelphia, Pennsylvania.*—Inventors and Manufacturers.
Ornamental clock-case of metallic composition, cast entire.

67. Hunter, N. D., 398 *Broadway, New York City.*—Agent.
Patent self-heating smoothing and tailors' irons.

68. Skinner, Salmon, 38 *Fulton Street, Brooklyn, New York.*—Manufacturer.
Self-heating flat-iron.

69. Brown, J. W., *Hartford, Connecticut.*—Manufacturer and Proprietor.
Self-heating rotary smoothing-iron.

70. McCullough & Co., *Wilmington, Delaware.*—Manufacturers.
American galvanized sheet-iron, for roofing and other purposes; miniature model-roof in galvanized iron.

71. Benedict & Burnham, 48 *Dey Street, New York City.*—Manufacturers.
Sheet and rolled brass, and German-silver; brass, copper, and German-silver ware.

72. Whitlock, John H., *Troy, New York.*—Manufacturer.
Specimens of cast and turned white Britannia metal ware.

73. Gould, Mitchell, 1½ *Platt Street, New York City.*—Manufacturer.
Specimens of brass and silver plated stair-rods.

74. Leroy, Thomas O., & Co., 263 *Water Street, New York City.*—Manufacturers.
Specimens of block-tin pipes for conveying water.

[The great objection to lead pipes for the conveyance of water is, that they may, and often do, impart a poisonous property to it, which has produced serious results in many cases. From the cheapness and ductility of lead, and fancied purity in their water, large cities continue to employ these pipes to conduct the water from the iron mains to the interior of houses, notwithstanding the objection to their use, founded on the highest scientific authority and on actual experience. These block-tin pipes are believed to be the first successful attempts at making them by hydraulic pressure in continuous lengths, and at a moderate cost; they are stronger, lighter, more readily worked, and less liable to injury from bruises than lead pipes, besides imparting no deleterious quality to the water.]

75. Gilbert, Joseph G., 216 *Pearl Street, New York City.*—Agent.
Castings of busts and statuettes in bronze and zinc.

76. New Jersey Bronze and Plating Works.—Manufacturer.
Gilded metal cornices for windows; curtain-bands.

[These ornaments are made from thin sheets of metal, by stamping with a "die" and "reverse." The die is made of steel or cast-iron, and is fixed by screws to the stamp; the reverse, having the design in relief, is attached to a descending hammer, which forces the thin metal into the die; when several blows are necessary, the metal is annealed between each blow.]

77. Bartholf, T. Waldron, 33 *Gold Street, New York City.*—Manufacturer.
A variety of brass cocks, faucets, and other articles used by plumbers and gas-fitters.

78. Hiler, Selah, *New York.*—Manufacturer.
Stair-rods and copper rivets.

79. Matthews, John, *Corner of 1st Avenue and 26th Street, New York City.*—Manufacturer.
Silver-plated soda-water drawing and bottling apparatus.

80. Goldsmith, Jr., H., 333 *Broadway, New York City.*—Manufacturer.
Patent inodorous portable water-closet.

80A. Carr, William J., *New York City.*—Manufacturer.
Self-acting pan water-closet.

81. Dardonville, H., 445 *Broadway, New York City.*—Manufacturer and Importer.
Gas-chandeliers; brackets, in new and rich styles; candelabra; ships' suspension-lamps; carcel-lamps; mechanical-moderator lamps.

82. Seidhoff, Dr. Charles, *Hudson, New York.*—Inventor.
Atmospheric-pressure lamp, with adjusting level.

83. Dietz, Brother & Co., 134 *William Street, New York City.*—Manufacturers.
Chandeliers for gas and oil; brackets and bracket-lamps; hall-lanterns; mantel ornaments, in gilt, bronze, and enamel.

84. Beers, Nathan T., 45 *Fulton Street, Brooklyn, New York.*—Manufacturer.
Wrought-iron gas-lanterns for the street.

85. Cornelius, Baker & Co., *Philadelphia, Pennsylvania.*—Patentees and Manufacturers.
Ornamental gas-chandeliers, brackets, pendants, and fixtures of every style; patent lamps; mantel ornaments.

[Till the year 1830, the whole trade in chandeliers was in the hands of foreign importers; now the market is supplied with home manufactures, of which the exhibitor is one of the largest producers. The ornamentation of these specimens of the art are in good taste, and admirably executed; figures of some of them are given on pages 157 and 158 of the "Illustrated Record."]

86. Walker, Alexander J., 417 *Washington Street, New York City.*—Inventor and Manufacturer.
Patent safety-fluid lamps, in metal and glass.

[These lamps are intended for burning any of the explosive fluids used for light, with safety. One great cause of explosion, viz., filling the lamps while burning, is here removed, as the act of unscrewing the top extinguishes the flame. The gas which forms in the lamp escapes through a vent provided for the purpose. They are not liable to leak at the top, or to overflow; the flame can be reduced to any desired size. Each tube is double, the inner one being attached to a spring, by which it moves within the fixed outer tube.]

87. Newell, John, *Boston, Massachusetts.*—Manufacturer.
Specimens of safety-lamps and cans.

[Burning-fluid and camphene, as they are commonly called, consist of distilled spirits of turpentine, mixed with alcohol in various proportions. In preparing burning fluids, other hydrocarbons are used, as wood-tar spirit, native naphtha, naphtha obtained from bituminous substances, and coal-tar naphtha, purified, and mixed with different proportions of alcohol. As the vapor of camphene is highly explosive, dangerous and fatal accidents are frequently occurring, from the carelessness of those who will continue to use it, preferring the risk of accident to the many disagreeable properties of oil. To such people as have not sense enough to refrain from filling their lamps while burning, the invention of Mr. Walker will prove an efficacious remedy against explosion from this cause. The safety of Mr. Newell's lamp depends on the principle adopted in the Davy safety-lamp, namely, the fact that wire gauze will arrest the progress of flame, and prevent an explosion of gas external to it, by reducing the temperature of the flame; both the tube containing the wick, and the tube into which this slides in the lamp, are made of fine silver-plated wire gauze, so that it is impossible for flame to communicate with the fluid in the body of the lamp as long as this gauze is unbroken. There is also a provision for the escape of the vapor. The cans are also protected by a similar gauze in the nose and at the mouth. By combining the spring-tube of Mr. Walker with the gauze protectors of Mr. Newell, it would seem that a zinc lamp for burning camphene and similar fluids, as made by Mr. Newell, would be quite as safe as any other lamp.]

88. Johnson, Job, *Brooklyn, New York.*—Manufacturer.
A great variety of patterns of fish-hooks; patent shank fish-hooks; hooks for sharks, halibut, salmon, cod, &c., &c.; American snap-hooks.

[Fish-hooks are made with very simple tools; straight wire of the proper length is flattened at one end, and the barb is formed by a simple blow with a chisel; the point is then sharpened, and the proper curve and twist given to the hook; the soft iron is then case-hardened, to give it the stiffness and elasticity of steel, by immersion in hot animal charcoal; the hooks are then brightened by friction and tempered.]

89. Cresson, William P., & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Various tinned, turned, and enameled culinary and household articles.

90. Blanchard, George T., & Co., *Concord, New Hampshire.*—Manufacturers.
Patent clasp-broom, with metallic adjusting-clasp.

91. Chevrier, L., *Trenton, New Jersey.*—Manufacturer.
Galvanized and tinned iron ware.

92. Hodgetts, Taylor & Hodgetts, 158 *William Street, New York City.*—Manufacturers.
Planished tin ware; zinc ware and japanned iron ware; water-cooler.

93. Rockwell, John W., *Ridgefield, Connecticut.*—Patentee and Manufacturer.
Patent save-all candlesticks; patent newspaper-files; invoice or letter files; patent bedclothes clasp, attached to a small bedstead to show its operation.

94. Arnold, Francis, *Middle Haddam, Connecticut.*—Manufacturer.
Combined lantern and foot-stove. A convenient article for the sick-room, for simple culinary purposes, for warming the feet in church, on sleigh-rides, &c.; very simple and portable, and an excellent piece of furniture for a bachelor.

95. Stachlen, William, *Williamsburgh, New York.*—Manufacturer.
Umbrella and parasol stands.

96. Windle & Co., 56 *Maiden Lane, New York City.*—Manufacturers.
Housekeeping articles of various kinds; planished tin ware; bathing apparatus; tea and coffee urns; dish-covers.

97. Smith, S. W., & Brother, 50 *Maiden Lane, New York City.*—Manufacturers and Importers.
Housekeepers' articles of all descriptions; japanned ware; block-tin ware, and wooden ware. Table cutlery and other articles; Britannia and plated ware; knife-cleaner. Kitchen furniture; upright mangles, for family use; wire dish-covers; chamber and nursery articles; roasting-jacks and Dutch ovens; refrigerators and ice-cream freezers; water-coolers; bathing apparatus; bronzed iron hat-stands, &c.

97A. Chapman, Jr., Samuel, *New York City.*—Agent and Manufacturer.
Aumock's Patent Cylindrical Knife Polisher.

[The rotary knife-cleaning apparatus deserves a place among the labor-saving machines of the family. It consists of a series of brushes, or leather pads, which are made to revolve vertically; the knives are arranged in slits on the circumference of the case, and are subjected on each side to the revolving brushes. With the aid of a polishing material, this machine will perform in a few minutes the labor of hours.]

97B. Peray, Moses, *New York City.*—Proprietor.
Knife-polisher; bread-slicing machine.

97C. Duncan & West, *New York City.*—Manufacturers.
Two mangles.

98. Keen & Hagerty, *Baltimore, Maryland.*—Manufacturers.
Specimens of japanned toilet ware, and water-coolers.

99. Pattison & Marshall, 407 *and* 409 *Cherry Street, New York City.*—Manufacturers.
Enameled iron hollow ware; hoppers, sinks, and basins, for water-closets; stair-rods.

100. Berrian, J. & C., 601 *Broadway, New York City.*—Manufacturers.
House-furnishing articles of japanned and plated ware.

101. Austin, A. H., *Baltimore, Maryland.*—Patentee and Manufacturer.
Improved ice-cream churns.

102. Perkins, G. H., *Portland, Maine.*—Manufacturer.
Upright refrigerators.

103. Cortlan & Co., *Baltimore, Maryland.*—Manufacturers.
Improved refrigerator and water-cooler.

[In making refrigerators, the object is to form an envelope, or series of envelopes, which shall be such poor conductors of heat, that the contained heat may not be affected by the temperature of the external air. Cases of air form good common walls for refrigerators, as air is a very poor conductor of heat; the forms are varied, and many are quite ornamental, but in all the principle is the same, viz., to surround the safe containing the ice with a poor conductor of heat.]

104. Jones & Hitchcock, *Troy, New York.*—Manufacturers.
A chime of bells.

105. Meneeley, A., & Sons, *West Troy, New York.*—Manufacturers.
A peal of church-bells; specimens of hotel, factory, school-house, ship, and steamboat bells.

[Bell-metal is composed of copper and tin, in the proportion of four of the former to one of the latter; small bells are cast in sand, large bells in loam. The above metal is very sonorous, and easily broken; the Indian gong, so famous for the richness of its tones, is made of copper and tin in the above proportions. The proportion of tin varies from one-third to one-fifth of the weight of copper, according to the size of the bell and the desired sound; small shrill bells generally contain a little zinc; lead and iron are sometimes added to large bells; house-bells are made of common bell-metal. The large church-bell was invented by Paulinus, Bishop of Nola, about the year 400; they are first spoken of in England by Bede, near the end of the 7th century. Nankin, in China, was anciently famous for its large bells; but these were afterwards far exceeded in size by the bells of Moscow—a bell in St. Ivan's Church in Moscow weighed over 57 tons; a bell given to the cathedral weighed over 128 tons; and another, given by the Empress Anne, probably the largest in the world, weighed over 192 tons, the height being nineteen feet, the circumference at the bottom sixty-four feet, and the greatest thickness twenty-three inches. The great

bell of St. Paul's, London, weighs 12,000 pounds, and is nine feet in diameter; the largest bell in England is "Great Tom," of Christ Church, Oxford, weighing 17,000 pounds.]

106. Clampett & Regester, *Baltimore, Maryland.*—Manufacturers.
A church-bell.

107. Buell & Veazy, *Chatham, New York.*—Manufacturers.
Strapped sleigh-bells.

108. Barton, Jason, *Middle Haddam, Connecticut.*—Manufacturer.
New sleigh-bells, round, and semicircular.

GREAT BRITAIN AND IRELAND.

109. Lowmoor Iron Company, *Yorkshire.*—Manufacturers.
Specimens of iron in all the stages of its manufacture. Samples of the coal and coke used in the furnaces; dross—the black iron-stone, containing 28 per cent. of iron; this lies immediately above the bed-coal, in six distinct strata, forming a bed five feet in thickness; the whole imbedded in shale. Specimens of pig and puddled iron; of iron of great thickness, bent cold. Boiler-plate, 19 feet 2 inches long, 4 feet 3 inches wide, and three-fourths of an inch thick, weighing 2700 pounds. Car-wheel and locomotive-tire; car-axle.

110. Jessop, William, & Sons, *Sheffield.*—Manufacturers.
Specimens of fine cast-steel; cast-steel saw-plates, one for a circular saw 6 feet 8 inches in diameter.

111. Russell, John, & Co., 69 *Upper Thames Street, London.*—Manufacturers.
Patent iron tubes and fittings.

112. Williams, Walter, *Staffordshire.*—Manufacturer.
Specimens of fine wrought-iron.

113. Russell, James, & Sons, *Wednesbury, Staffordshire.*—Manufacturers.
Lap-welded boiler-tubes; elbows and fittings.

114. Jewitt & Battie, *Saville Works, Sheffield.*—Manufacturers.
Specimens of shear and cast steel, for engineers and machinists; cast-steel files.

115. Lloyd, George B., Jr., *Birmingham.*—Manufacturer.
Lap-welded iron tubes, for steam-boilers and hydraulic presses.

116. Bolckow & Vaughan, *Middlebro'-on-Tees, Yorkshire.*—Manufacturers.
Specimens of iron ores and iron; varieties of iron rails.

117. Sterling, John D. M., *Larches Camphill, near Birmingham.*—Patentee.
Improved wrought and cast iron, and iron alloys.

118. Brown, John, *Atlas Steel Works, Sheffield.*—Patentee and Manufacturer. (Agent, John S. Webb, 15 *Gold Street, New York City.*)
Springs for rail-cars; files and rasps for machinists. Patent conical railway buffer-springs, with fittings for locomotive engines, and for various styles of railway carriages; conical buffer-spring on a block, with model buffers attached to show the principles of its operation.

119. Wright, Peter, *Dudley, Warwickshire.*—Patentee and Manufacturer.
Patent solid box-vice; patent stamped anvil.

120. Baker, William, 14 *Allen Street, London.*—Manufacturer.
Awls, bodkins, and brads, of various descriptions.

121. Turton, Thomas, & Sons, *Sheaf Works, Sheffield.*—Manufacturers.
Files and rasps of all descriptions; bar iron.

122. Hargreaves, William, & Co., *Sheffield.*—Manufacturers.
Files and rasps of all descriptions.

123. Marriott & Atkinson, *Fitzalan Works, Sheffield.*—Manufacturers.
Files and rasps, in various stages of manufacture; model for locomotive-engines; car-springs; dray and wagon springs; plate of burnished cast-steel, having on it a view of the Fitzalan Works.

124. Chance, William, Son, & Co., *Birmingham.*—Proprietors.
Various sizes of coil and stud ships' chains; wrought-iron stud-chain, as adopted by the Submarine Committee at Liverpool; fence-chains.

125. Morewood & Rogers, *Upper Thames Street, London.*—Inventors and Manufacturers.
Galvanized tinned iron for gutters, pipes, telegraph-wire, &c.; model of buildings covered with this for roof and sides; plumbic zinc for roofs.

[The plumbic zinc consists of distinct layers of lead and zinc, united in the process of manufacture, one side being pure zinc, the other pure lead. The lead side, being placed outward for roofing, protects the zinc from the atmospheric influences which would otherwise cause its speedy decay, while the zinc stiffens and supports the lead; the plumbic zinc does not require to be made more than one-fourth as thick as sheet-lead, and is therefore desirable in an economical point of view.]

126. Smith, William, & Co., *near Birmingham.*—Manufacturers.
Improved steel wire for musical instruments.

127. Sellers, John, *Sheffield.*—Manufacturer.
Fine machine-ruled steel plates for engravers, with impressions from the same.

128. Hopper, George, *Durham, Birmingham.*—Manufacturer.
Iron rods, axles, and pins.

129. Simmon, Pemberton & Sons, *Birmingham.*—Manufacturers.
General cabinet brass-foundry, comprising cornices, curtain-bands, hinges, fastenings, escutcheons, bell-pulls, door-springs, knockers, castors, &c., ornamented with porcelain.

130. Hill, Brothers & Co., *Walsall.*—Manufacturers.
Plated belts, stirrups, spurs, and bits.

131. Marlow, James, *Walsall.*—Manufacturer.
Saddlery hardware, bits, and stirrups.

132. Hardy, Thomas, *Sheffield.*—Manufacturer.
Crochet-needles, button-hooks, tweezers, nail-files, corkscrews, boot-hooks, stiletoes, and other small steel articles.

133. Kirby, Beard & Co., *Cannon Street, London.*—Manufacturers.
Entomological, toilet, shawl, blanket, mourning, lace, and hair pins; bodkins; harness, glovers', fur, tambour and chenille, darning, bookbinders', straw, surgeons', sail, packing, and netting needles; crochet-hooks; hooks and eyes; a variety of fish-hooks of different sizes.

134. Shrimpton & Hooper, 12 *King Square, London.*—Manufacturers.
Needles, in the various stages of manufacture; needle-eyes, punched in human hair.

135. Rimmer, John, & Son, *Alcester.*—Manufacturers.
Drilled-eyed needles of all descriptions; fish-hooks.

136. Milward, Henry, & Sons, *Redditch, England.*—Manufacturers.
A great variety of needles; specimens of the "gold inlaid oval-eyed" needles; ornamental devices, made of needles and fish-hooks attached to scarlet cloth. Fish-hooks, and fishing tackle.

[Needles are made from the best steel wire; after being cut of the proper lengths, by shears which will cut 400,000 in ten hours (each length being made into two needles), they are straightened by being passed under a heavy iron plate; they are then pointed by grinding on a rapidly revolving grindstone; they must be ground dry, in order to prevent rusting, causing the air to be filled with a silicious and steel dust, which formerly was very injurious to the lungs and eyes of the workmen; the evil effects are now prevented by a powerful fan. They are then cut in two, the heads flattened, and the eyes pierced by children or by machinery; after the eye has been smoothed, they are tempered on steel plates, and are plunged suddenly into cold water, which makes them very hard and brittle. The needles are then polished by long friction with quartzose sand and some oily substance, scoured by sawdust, winnowed, and sorted.

The manufactory of Messrs. Henry Milward & Sons was established in 1730; about forty years ago machinery was introduced into the manufacture, so that where formerly only 150 could be made in an hour, now about 7000 can be finished in the same time; six millions of needles are produced weekly in their establishment. One "pointer" will make the points of needles at the rate of 12,000 in an hour; in their mills at Washford they employ twelve pointers. The needles of English manufacture are decidedly superior to those of any other country, and are extensively used in every civilized part of the globe.]

137. Clark, Thomas and Charles, & Co., *Wolverhampton, England.*—Manufacturers.
Enameled cast-iron hollow ware; cast butt hinges.

138. Parker & Thompson, *Sheffield.*—Manufacturers.
Gutta-percha topped skates; joiners' tools.

139. Hill, Joseph, *Birmingham.*—Manufacturer.
Stamped ornaments for lamps and chandeliers; six-light chandelier, body and arms; lamps.

140. Cox, Joseph and John, *Wolverhampton and New York City.*—Manufacturers.
Bronze figures, gas-chandeliers, candelabra, &c.

141. Hoole, Roblon, & Hoole, *Green Lane Works, Sheffield.*—Manufacturers.
Drawing-room, dining-room, and other register grates; fender and fire-irons.

142. Wakefield, Francis, *Mansfield, Nottinghamshire.*—Designer and Manufacturer.
Great Western prize-medal cooking apparatus, and a gas-cooking stove.

[The advantages of cooking by gas are so great, that the old prejudices against

its use are fast disappearing. Common coal-gas is a carburetted hydrogen, or hydrogen saturated with carbon vapor; if a sufficient supply of atmospheric air is secured, the combustion takes place without any smoke, though it is easy and always proper to remove carbonic acid in the gas-cooking stoves. Heating by gas is very economical, as the heat is obtained at once, and the gas turned off when not wanted. Forty-five gallons of water may be heated to 90° Fahrenheit in six minutes, by thirty cubic feet of gas, for less than twopence in England; the cheapness of gas, the great waste of fuel in any possible apparatus for burning coal, and the necessity of keeping a coal-fire when it is not wanted for cooking, render gas-cooking, at least for the summer months, a great improvement in an economical point of view; for extemporaneous use, gas must always be cheaper than coal. A coil of iron tubing, disposed so as to present a great surface to the heat of gas, may be economically heated, so that a stream of water entering at one end cold will flow out at the other of any required temperature, according to the velocity of the current and the amount of gas consumed: this must be of great advantage in hospitals and public institutions; the heating power of gas has been ascertained to be three times that of Newcastle coal, in boiling off an amount of water; and even one-third of the gas-heat passes off unabsorbed by the boiler, which might be saved by improved apparatus. The use of gas in cooking is cleanly, as there is no dust or ashes; safe, as there are no sparks or soot to render chimneys unsafe, or set fire to the clothes of careless persons and children. Gas-cooking has now been sufficiently tried in England, especially by M. Soyer, in his large establishments, to prove not only its economy, cleanliness, and convenience, but its powers of remarkably retaining the juices and flavor of meats prepared by it.]

143. Baadshaw & Lansom, *Mansfield.*—Manufacturers.
Cooking-stove and apparatus for emigrants.

144. Remington, Miss Annie, *Chelsea, London.*—Inventor.
Patent roasting apparatus, with self-acting baster, and heat reflectors; the heat is reflected downward, as well as in other directions.

145. Schoolbred, Loveridge & Schoolbred, *Wolverhampton.*—Manufacturers.
Japanned tea-trays, waiters, baths, tin ware, household articles, and kitchen ware.

146. Roberts, John, *Kent, England.*—Manufacturer.
Domestic utensils; enameled and tinned cooking apparatus.

147. Thornton, James, & Son, *Birmingham.*—Manufacturers.
Patent lamps, japanned box, and kitchen utensils.

BRITISH COLONIES—CANADA.

148. Howard, *Quebec, Canada East.*—Manufacturer.
Specimens of improved horse-shoes, for hunting, carriage, and saddle horses; concave shoes.

149. McLean, Thomas H., *Quebec, Canada East.*—Manufacturer.
Specimens of improved horse-shoes.

[The patent concave shoes prevent balling in snow and slipping on ice; they are well adapted for trotting-matches. The inner part of the shoe is slightly elastic, allowing for the play of the frog.]

150. Piper, Hiram, *Toronto, Canada West.*—Designer and Manufacturer.
An improved hip-bath; shower-bath; easy-chair and commode.

151. Mackleur, Oliver T., *Chippewa, Canada West.*—Manufacturer.
A Victoria drawing-room stove; a gothic air-tight parlor stove, and a gothic open-front stove.

152. Rutland, Sheriff, *Coburg, Canada West.*—Inventor.
A patent ventilating ornamental stove.

153. Griffin, J. K., *Burford, Canada West.*—Inventor and Manufacturer.
The "kitchen-queen" cooking-stove (patented in Canada).

[This is an air-tight double-draft stove, with a shifting grate, for graduating at will the size of the fire-place. Its advantages are economy, superior draft, durability, excellence of the oven (heated on 6 sides), simplicity, and adaptiveness to all seasons.]

BRITISH COLONIES—NEWFOUNDLAND.

154. Neyle, Richard, *St. John's.*—Manufacturer.
A variety of fish-hooks; squid jiggers.

155. Peace, *St. John's.*—Inventor and Manufacturer.
Sheet-iron chimney-top piece, securing a draft by wheels in the sides rotating on a horizontal axis, and preventing a draft down the chimney by the reflection inwards of the edges.

FRANCE.

156. L'Oeschger, Mesdach & Co., *Paris.*—Manufacturers.
Sheet brass, zinc, copper, and German-silver.

157. Tronchon, *Avenue St. Cloud, near Paris.*—Manufacturer.
Iron furniture for apartments, and garden ornaments.

158. Ovide, Martin & Viry, *Sommervoire, Haute-Marne and Paris.*—Manufacturers.
Internal and external cast-iron ornaments for houses.

159. Fontaine, Came & Co., *Frith St. Leger, Nord.*—Manufacturers.
Samples of nails for boots and shoes, and shoemakers' awls.

160. Siaot, P., Sen., *Valenciennes, Nord.*—Manufacturer.
Horse-shoe nails; shoe nails and pegs, in iron, copper, and steel; copper, brass, and steel brads.

161. Camion, A., *Vrigne-aux-Bois, Ardennes.*—Manufacturer.
Locks, hinges, knobs, and fastenings, for houses and furniture.

162. Descreux & Son, *St. Etienne, Loire.*—Manufacturers.
A variety of tools for shoemakers and saddlers.

163. Chauffiat & Son, *St. Etienne, Loire.*—Manufacturers.
Furnaces, anvils, vices, bellows, and other implements, for forges.

164. Durafour, Nephew, *St. Etienne, Loire.*—Manufacturers.
A variety of locks.

165. Coulaux & Co., *Motsheim, Bas-Rhin.*—Manufacturers.
Screws, butts, hinges, vices, rasps, and other hardware.

166. Grangoir, J. M., Jr., *Paris.*—Inventor and Manufacturer.
Various specimens of locks of new style.

167. Bellard, *Paris.*—Manufacturer.
An assortment of locks and bolts.

168. Pottecher, B., *Bussang.*—Manufacturer.
Specimens of currycombs; German-silver spoons and forks.

169. Santallier, Felix, *Boen, Loire.*—Manufacturer.
Steel combs of various kinds.

170. Roswag, A., & Son, *Schlestadt, Haut Rhin.*—Manufacturers.
Metallic gauzes and cloth, and various manufactured articles of household convenience.

171. Caumes, M. F., *Paris.*—Manufacturer.
Instrument to aid in threading needles.

172. Vandenbroucke, E., 16 *Rue du Strasbourg, Paris.*—Patentee and Manufacturer.
Coffee-roasters, on a newly invented and patented system, for preserving the fragrance of coffee, by taking off its dampness.

[At the end of the roller there is a little door, which is left open till the coffee changes color; by shutting this the flavor is concentrated, and the roasting is produced by the vapor of the coffee. In the inside of the roller is a piece of woven wire, which prevents the coffee from touching the sheet-iron, and keeps it from burning; the stand is of cast-iron, to admit of the burning of wood, coke, or charcoal; there is a little rail to draw the roller back, and an iron support to hold it.]

173. Siry & Co., *Paris.*—Inventors and Manufacturers.
Coffee-pots upon a patent system.

174. Harcher & Westermann, *Metz, Haut Rhin.*—Manufacturers.
Various articles of household convenience in zinc and tin.

175. Japy, Brothers, & Lalange, *Beaucourt, Haut Rhin.*—Manufacturers.
An extensive assortment of tinned and enameled iron ware, for culinary and domestic purposes.

176. Société de la Vieille Montagne, *Paris.*—Manufacturer.
Candelabra, and various fancy groups and articles in zinc; zinc statuettes.

177. Guinier, T., 25 *Rue Grenelle, St. Honoré, Paris.*—Patentee and Manufacturer.
Specimens of inodorous water-closets and faucets; a new system, patented in Europe.

178. Talibou, V., *Loches, near Paris.*—Manufacturer.
Inodorous water-closets for the sick-chamber.

THE GERMAN STATES.

179. Reinard, Count, *Mecklenberg-Strelitz.*—Proprietor.
Specimens of fine cast-iron and steel.

180. Menis & Budeauss, *Eschweiler, Bavaria.*—Manufacturers.
Specimens of lead in bars.

181. Auschuetz, C. H. R., *Zella, Saxe-Gotha.*—Manufacturer.
Samples of fine steel.

182. Royal Saxon Mining Company, *Freyburg, Baden.*—Manufacturers.
Specimens of lead, litharge, and shot of various sizes.

183. Ruffer & Co., *Breslau, Prussian Silesia.*—Manufacturers.
Assortment of fine zinc plates, some of them very thin; they may be bent, hammered, and wrought in any manner without breaking; made from the best Silesian spelter.

184. Zinc Manufactory (Emilie Paulinen-Huttel), *Gleiwitz, Saxony.*
Zinc, sheet zinc, and album of zinc paper.

185. Harkort, P., & Son, *Wetter-on-the-Ruhr, West Prussia.*—Manufacturers.
Samples of sheet-iron.

186. Wolf, Julius H., *Burgstadt, near Chemnitz, Saxony.*—Manufacturer.
Sample card of iron, copper, and brass nails, tacks, and rivets.

187. Schmidt, J. D., Jr., *Sprochoevel, Prussia.*—Manufacturer.
Locks and locksmiths' ware; a variety of hardware, comprising vices, bolts, hinges, screws, chains, bits, gimlets, nippers, chisels, saws, and files.

188. Bunger, Jacob, Jr., *Barmen, Prussia.*—Manufacturer.
Iron, steel, and brass tools; including saws, gimlets, bits, gouges, shears, skates, chisels, planes, vices, cleavers, trowels, files, and rasps; porte-monnaies.

189. Christian, Brothers, *Cronenberg, Rhenish Prussia.*—Manufacturers.
A variety of tools for carpenters, tanners, coopers, &c.; shears; rasps.

190. Bleckmann, John E., *Rousdorf, Hesse.*—Manufacturer.
Specimens of locks, brace-bits, skates, compasses, vices, and files.

191. Schmidt, P. Ludwig, *Alberfeld, Prussia.*—Manufacturer.
Jacks, vices, cranes, carriage-springs, pickaxes, and other hardware.

192. Boeker, R. & H., *Remscheid, Rhenish Prussia.*—Manufacturers.
Hardware and cutlery of many varieties.

193. Hammon, G. C., (Widow), *Nuremberg, Bavaria.*—Manufacturer.
A variety of articles manufactured of fine steel; cutlery and surgical instruments.

194. Hoffmann, Nicholas, *Nuremberg, Bavaria.*—Manufacturer.
A variety of fine steel articles.

195. Schmidt & Moelleuhoff, *Aix-la-Chapelle, Prussia.*—Manufacturers.
An extensive assortment of iron and steel hardware.

196. Krausse, H., *Mentz, Prussia.*—Manufacturer.
Bronze castings and ornaments, in great variety.

197. Seebass, A. R., & Co., *Offenbach on the Maine.*—Manufacturers.
An extensive assortment of bronzed iron inkstands, candelabra, groups, and fancy articles.

198. Keutgen, C. (Heirs), *Iserlohu, Westphalia.*—Manufacturers.
Gilt brass curtain ornaments.

199. Sanner, A. V. & G., *Schmalkalden, Prussia.*—Manufacturers.
Samples of iron and steel ware; pistols, snuffers, needles, tuning-forks, &c.
[The tuning-fork was invented by John Shore, an Englishman, sergeant-trumpeter to George I.]

200. Reizenstein & Moeller, *Aix-la-Chapelle, Prussia.*—Manufacturers.
Iron and steel goods, cutlery, and bronzes.

201. Lucas, F. W., & Co., *Elberfeld, Rhenish Prussia.*—Manufacturers.
Hardware, bronzed zinc castings, candlesticks, inkstands, paper weights, lamp-stands, &c.

202. Boeck, J. M., *Nuremberg, Bavaria.*—Manufacturer.
A variety of steel and gilt chains; hooks and eyes.

203. Bauss, Hermann, *Solingen, Prussia.*—Manufacturer.
Steel clasps and porte-monnaie frames.

204. Kissing & Moellmann, *Iserlohu, Prussia.*—Manufacturers.
A variety of brass curtain ornaments.

205. Schatt, J. G., *Nuremberg, Bavaria.*—Manufacturer.
Candlesticks and other brass ware.

206. Theirfelden, *Nuremberg, Bavaria.*—Manufacturer.
Various samples of tin and pewter ware.

207. Stohrer, T. F., *Stuttgard, Wurtemberg.*—Manufacturer.
Brass and steel wire gauzes; wire and horse-hair sieves.

208. Brozler & Son, *Bornheim, near Frankfort.*—Manufacturers.
A variety of imitation bronzes, inkstands, watch-stands, and fancy articles.

209. Koenig, Arthur, *Nuremberg, Bavaria.*—Manufacturer. (Agents, Chas. Mueller & Co., 30 *Platt Street, New York City.*)
Specimens of brass and steel wire.

210. Heroldt, J. E., *Nuremberg, Bavaria.*—Manufacturer.
Brass candlesticks; chandeliers; mortars; smoothing-irons.

211. Fehrmann, *Bremen.*—Manufacturer.
A strong iron box-safe.

212. Putzenberger, Adam, *Lower Bavaria.*—Manufacturer.
Warming-bottles.

213. Pabst, *Nuremberg, Bavaria.*—Manufacturer.
Brass weights.

214. Helmreich, Moll, & Co., *Manheim, Baden.*—Manufacturers.
Pattern-book of wire rails.

215. Giesing, J. C., *Nuremberg, Bavaria.*—Manufacturer.
Tea-urns, binnacle-lamps, candlesticks, and other articles of hardware.

216. Renner, J. L., *Nuremberg, Bavaria.*—Manufacturer.
Various articles of useful and fancy hardware, candlesticks, table-ware, inkstands, &c., of pressed metal.

217. Baumann, *Goeppingen.*—Manufacturer.
Brass bird-cages.

218. Fischer, Heinrich, *Leipsic, Saxony.*—Manufacturer.
Pins of various kinds for entomologists.

219. Wiss, J. D., *Nuremberg, Bavaria.*—Manufacturer.
Specimens of needles.

220. Schleicher, Charles, *Aix-la-Chapelle.*—Manufacturer.
Galvanized cast-steel wire; needles in various stages of manufacture.

221. Baum, Frederick, *Nuremberg, Bavaria.*—Manufacturer.
Samples of crochet and netting-needles.

222. Distel, —, *Nuremberg, Bavaria.*—Manufacturer.
Specimens of needles and needle-wire.

223. Neuss, H. J., *Aix-la-Chapelle.*—Manufacturer.
Specimens of needles and pins; shawl and hair-pins.

224. Beissel, S. (Widow) & Son, *Aix-la-Chapelle.*—Manufacturers.
Specimens of needles made from English cast-steel, rolled and drawn into wire in Germany; model of a machine for drilling the eyes of needles.

225. Oertle & Hertlein, *Nuremberg, Bavaria.*—Manufacturers.
Specimens of silver-plated and black hooks and eyes.

226. Hummel, E., *Nuremberg, Bavaria.*—Manufacturer.
Hooks and eyes; toilet and hair pins.

227. Reichenfuss, G. B., *Nuremberg, Bavaria.*—Manufacturer.
Silver-plated hooks and eyes.

228. Hosterey, J. P., *Barmen, Rhenish Prussia.*—Manufacturer.
Plated and copper hooks and eyes.

229. Nuremberg Manufacturing Company, *Nuremberg.*—Manufacturers.
Samples of hooks and eyes.

230. Buderus & Sons, *Lochnberger-hütte, Nassau.*—Manufacturers.
Enameled-iron kitchen utensils.

231. Levy, Brothers, *Frankfort-on-the-Oder, Prussia.*—Manufacturers.
Japanned lamps, boxes, trays, and metal ware.

232. Denecker, M., *Nuremberg, Bavaria.*—Manufacturer.
Specimens of japanned ware.

233. Wolff, Brothers, *Neheim, Prussian Westphalia.*—Manufacturers.
Lamps, candlesticks, lanterns, tinder-boxes, snuffers, &c.

234. Holzchuber, Brothers, *Schleiz, Reuss.*—Manufacturers.
Brass lamps and other articles; candlesticks ornamented with porcelain.

235. Assmann, J., *Neuwied-on-the-Rhine.*—Manufacturer.
Culinary utensils, made of rolled sheet-iron, and tinned with Banca tin.

236. Rau & Co., *Goeppingen, Wurtemberg.*—Manufacturers.
A variety of articles of japanned ware and papier maché; bird-cages.

237. Weuefaitz, Siomond, *Nuremberg.*—Manufacturer.
Brass tea-kettles, candlesticks, lamps, and jelly-moulds.

238. Normann, J. G., *Nuremberg.*—Manufacturer.
Moulds and forms in metal for confectioners' use.

239. Siebenkas, F. P., *Nuremberg.*—Manufacturer.
Hand-bells of various descriptions.

240. Satt, —, *Nuremberg.*—Manufacturer.
A variety of hand-bells.

241. Petbitsch, C. E., *Nuremberg.*—Manufacturer.
Table and hand-bells, of various patterns.

242. Rosenlacher, Carl, *Constance, Baden.*—Manufacturer.
A peal of four bells, highly ornamented.

THE AUSTRIAN EMPIRE.

243. Van Salm, Prince, *Vienna.*—Manufacturer.
A candelabrum of cast-iron. (For figure see Record, page 176.)

244. Dubsky, Count, *Lissitz, Bohemia.*—Manufacturer.
Samples of iron, copper, and brass-wire tacks.

245. Klement, F., *Stadt Steyr, Austria Proper.*—Manufacturer.
Samples of coach-makers', furriers', and coopers' tools.

246. Begsteiger, M., *Stadt Steyr.*—Manufacturer.
Varieties of carpenters' rules.

247. Grossaner, Ignaz, *Waidhofen, Austria Proper.*—Manufacturer.
Samples of different kinds of pincers.

248. Tenfelmayer, K., *Stadt Steyr.*—Manufacturer.
A vice, screw-stock, dies, and taps.

249. Sailer, T., *Stadt Steyr.*—Manufacturer.
Samples of coach-makers', furriers', and coopers' tools.

250. Weidel, M., *Stadt Steyr.*—Manufacturer.
Samples of machine-made nails.

251. Weisenhofer, Ignaz, *Waidhofen.*—Manufacturer.
Samples of door-hinges.

252. Egger, J. B., *Villach, Carinthia.*—Manufacturer.
Sample of a lead pipe.

253. Mayer, John, *Waidhofen.*—Manufacturer.
Various kinds of hardware.

254. Boeschinger, Francis, *Waidhofen.*—Manufacturer.
Samples of ship-clamps.

255. Kloss, Charles, *Konitz, Moravia.*—Manufacturer.
Samples of iron and brass-wire sieves.

256. Weiss, Charles, *Waidhofen.*—Manufacturer.
Samples of fish-hooks.

257. A variety of *hardware* is exhibited by the following makers:
Schaschl, V., *Ferloch, Carinthia.*
Leitz, Joun, *Waidhofen, Austria Proper.*
Leitz, Felix, *Waidhofen, Austria Proper.*
Schoelnhammer, Dominick, *Waidhofen, Austria Proper.*
Teufel, Simon, *Waidhofen, Austria Proper.*
Hofer, Francis, *Waidhofen, Austria Proper.*

258. Samples of *locks* and *padlocks* are exhibited by:
Leimer, Joseph, *Waidhofen, Austria.*
Hartmann, Francis, *Waidhofen, Austria.*
Hartmann, John, *Waidhofen, Austria.*

259. *Files* and *rasps* are exhibited by:
Wiener, Joseph, *Waidhofen, Austria.*
Schneider, Leopold, *Waidhofen, Austria.*
Mayer, Joseph, *Waidhofen, Austria.*
Furtner, Engelbert, *Waidhofen, Austria.*
Lechner, M., *Stadt Steyr, Austria.*
Sonnleithner, A., *Stadt Steyr, Austria.*
Nussbanmer, L., *Stadt Steyr, Austria.*
Preitler, M., *Stadt Steyr, Austria.*
Unzeitig, F., *Stadt Steyr, Austria.*
Beyer, A., *Stadt Steyr, Austria.*
Furtner, Francis, *Waidhofen, Austria.*
Reichl, J., *Stadt Steyr, Austria.*
Vater, F., *Neuzeng, Austria.*

260. Kurz, K., *Stadt Steyr, Austria.*
A snaffle, curb, and horse-buckle.

261. Ring, J., *Stadt Steyr, Austria.*—Manufacturer.
Samples of steel for striking light.

262. Vingert, A., *Stadt Steyr, Austria.*—Manufacturer.
Samples of tacks.

263. Bachner, F., *Stadt Steyr, Austria.*—Manufacturer.
Samples of shoemakers' tools.

264. Grossaner, F., *Stadt Steyr, Austria.*—Manufacturer.
Samples of shoemakers' tools.

265. Blumaner, W., *Stadt Steyr, Austria.*—Manufacturer.
Samples of horse-bells.

266. Hirschl, F., *Bruenn, Moravia.*—Manufacturer.
Various articles in pewter; trays and tea-pot.

267. Schrotmueller, Leopold, *Waidhofen, Austria.*—Manufacturer.
Various kitchen utensils of iron.

268. Schramaok, Simon, *Waidhofen, Austria.*—Manufacturer.
Currycombs, and other articles of hardware.

269. Koller, F., *Steinbach, Austria.*—Manufacturer.
Samples of currycombs.

270. Pleischl, A., & Son, *Vienna.*—Manufacturers.
Cooking utensils, lined with non-metallic enameling.

THE ITALIAN STATES.

271. Tosi, V., *Genoa, Sardinia.*—Manufacturer.
Busts and figures, cast in zinc and bronze.

BELGIUM.

272. Delloy & Co., *Huy.*—Manufacturers.
Sheet-iron.

273. Lamarche, —, *Brussels.*—Manufacturer.
Sheet-zinc.

274. Chandoir, H., & Son, *Liège.*—Manufacturers.
Wrought and galvanized iron spikes and nails.

275. Maquinay, Brothers & Co., *Liège.*—Manufacturers.
Wrought-iron nails and spikes in great variety.

276. Petry, J. A., *Liège.*—Manufacturer.
Snuffers, bullet-moulds, cork-screws, and other hardware.

277. Metz & Co.—Manufacturers. Agent—(E. Caylus, 255 *William Street, New York City.*)
Various fancy articles in bronze.

THE NETHERLANDS.

278. Koster, A. S., *Rotterdam.*—Manufacturer.
Tree in cast-lead.

279. Nolet, Cornelius, *Schiedam, Netherlands.*—Manufacturer.
Cast-iron figures of stags, on the Palace steps on the Sixth Avenue; cast-iron bust of the late king of the Netherlands.

280. Allganer, J. J., *Amsterdam.*—Manufacturer.
Tools for mechanics and musical instrument makers.

281. Dergoten, J. L., *The Hague, Netherlands.*—Manufacturer.
Specimens of grates and locks.

282. Legeer, B., *Deventer, Netherlands.*—Manufacturer.
An ornamental grate.

283. Schutz, L. W., *Zeijst, near Utrecht, Netherlands.*—Designer and Manufacturer.
Castings in zinc, for utility and ornament, comprising figures, animals, vases, articles of furniture, and fancy goods.

284. Doeders, J., Jr., *Haarlem.*—Manufacturer.
A system of bell-pulls for offices and hotels.

285. Petit & Fritsen, *Aarlerixtel, near Helmond, Netherlands.*—Manufacturers.
Cast bells for a chime.

SWEDEN.

286. ——, —, *Soderhamn, Sweden.*—Producer and Manufacturer.
Samples of wrought-iron, for musket-barrels, and iron wire.

287. Ekman, Gustav, *Philipstadt, Sweden.*—Manufacturer.
Samples of steel.

[The Swedish iron and steel are famous for their excellence. One of the causes of the superiority of the Swedish iron for conversion into steel seems to be, that the ore is the magnetic iron ore; another cause is the use of charcoal or wood, or both, instead of coal or coke, by which carbon is supplied in a form purer, and possibly capable of entering more readily into combination with the iron, than mineral fuel. About 90,000 tons of iron are made annually in Sweden, of which 70,000 tons are exported.]

SECTION III. CLASS XXIII.

WORKS IN PRECIOUS METALS, BRONZES, ETC.

Works in all kinds of precious metals, bronzes, and similar articles of virtu, occupied a large space in the Exhibition, and formed one of its most considerable and attractive features. The specious brilliancy and intrinsic value of these works drew the attention of many visitors, but the beautiful art and workmanship also secured the admiration justly due to their display. The Exhibition offered a better opportunity than was ever before given to the American public, to inspect this branch of art manufacture, in an extensive series of its best and its worst examples. A very large number of both kinds of these examples have been engraved in the Illustrated Record of the Exhibition, and, as far as the limited space of that work allowed, the merits or defects of the pieces were pointed out. It is to be expected that the Exhibition will extend more widely than any other means could do, a knowledge of a fundamental law which obtains in works of this class, viz., that art must give value to metal, and not the metal value to art.

The display of artistic bronzes in the French Department was extensive and wholly satisfactory. In the manufacture of ornamental works in bronze the French are unrivalled. Very beautiful specimens are shown in the English Department of the new art of electrotypy as applied to the production of works of ornament and luxury. The scientific principles of electrotypy are discussed in the Illustrated Record, page 53. Both France and England furnish exquisite examples of artistic works in oxydised silver. The manufacturers of the United States contribute a great variety of table furniture of creditable workmanship. The specimens are of solid metal and also electroplated. Switzerland sends a variety of jewelry and fine watches. A variety of cameos, brooches, chased and enamelled articles are contributed from Italy.

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1. Jones, Ball & Co., *Boston, Massachusetts.*—Manufacturers.

The Webster vase in silver; silver tea sets; pitchers, waiters, vases, forks, spoons, and other silver ware.

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2. Keyworth, R., *Washington, D. C.*—Manufacturer.

A casket in gold and silver, representing a golden melon on a silver vine leaf, with a silver vine running over the top, and surmounted by a silver bird.

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3. Ball, Black & Co., *New York City.*—Manufacturers.

Tea-service, consisting of twenty-nine pieces, in California gold, richly embossed, on a pedestal and plateau of silver. The "Collins" service of gold plate, composed entirely of California gold, and valued at $5,000, displaying great taste and skill in the manufacturers. An assortment of gold and silver ware.

[The Collins gold plate commemorates an event of national importance, which is sufficiently explained by the following inscription: "This service of plate is presented by the citizens of New York to Edward K. Collins, in testimony of the public sense of the great honor and advantage which has been conferred upon this city and the whole country, through his energy and perseverance in the successful establishment of an American Line of Transatlantic Steamers, August, 1851." Some of the pieces are figured on page 107 of the Record.]

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4. Bailey & Co., *Philadelphia, Pennsylvania.*—Manufacturers.

An assortment of gold and silver ware. (Many of the pieces are figured on pages 64, 65, and 112 of the Record.)

Bailey & Co.—Silver Dish.

5. Tiffany & Co., *New York City.*—Manufacturers.

A rich silver vase, supported by figures; tea, coffee, dessert, and wine service, in silver and crystal. (The first piece is figured on page 45 of the Record.)

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6. Stevens, John C., *New York City.*—Proprietor.

The silver prize-cup won by the Yacht "America" in the race at Cowes, England, in 1851.

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7. Pope & North, *New York City.*—Manufacturers.

Gold-plated metal.

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8. Rogers, Brothers, *Hartford, Connecticut.*—Manufacturers.

Heavy silver-plated ware of every description.

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9. Coles, Albert, & Co., *New York City.*—Manufacturers.

Silver butter, fish, dessert, and other knives and forks; knife, fork, and spoon in case.

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10. Chamberlin, Joseph, *New York City.*—Agent.

Electro silver-plated tea-sets; cake baskets, spoons, forks, castors, and other table furniture.

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11. Usener, William, *New York City.*—Manufacturer.

Silver castings; a silver basket with flowers, and silver fruit-basket.

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12. Weaver, F., *Williamsburgh, New York.*—Manufacturer.

A silver goblet, spun up from a single piece; a silver candlestick, and goblet in halves.

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13. Adams & Kidney, *New York City.*—Manufacturers.

A service of plate.

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14. Berrian, J. & C., *New York City.*—Manufacturers and Importers.

Specimens of silver-plated ware; fine Britannia and planished ware; plated candelabra.

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15. Peckham, Dennis, & Co., *New York City.*—Proprietor.

A set of chess figures in gold and silver.

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16. Reed & Barton, *Taunton, Massachusetts.*—Manufacturers.

Britannia ware; electro silver plate in great variety.

[This extensive assortment is mostly from original designs, comprising specimens of Britannia, electro-silvered, and gilt ware, of flat and raised work. More than a hundred persons are employed in their manufactory at Taunton, Massachusetts.]

17. Atwood, George F., *Taunton, Massachusetts.*—Manufacturer.
Silver-plated and Britannia ware.

18. Ames, James T., *Chicopee, Massachusetts.*—Manufacturer.
A large assortment of rich gilt and plated ware for tea and dinner services, all plated upon German silver, comprising 14 different styles of castors, 6 different styles of cake baskets, 6 do. of butter knives, 6 do. of tea-sets, 10 do. of waiters; vegetable dishes, gilt and plated; salt cellars, gilt; wine coolers, soup tureens, and sugar bowls, gilt; fruit stands, tea kettle and heater, punch bowls, ice bowls, slop bowls, and knife baskets, in different styles.

[The discovery of the electrotype process was made by Mr. Thomas Spencer, of Liverpool, England, having been suggested to him by observing the exact copy in metal of some imperfections left in the cell of one of his batteries. The process, in a few words, is as follows: a medal, of which the copy is desired, is placed in connection with a zinc plate by means of a copper wire; these are placed in a vessel divided into two cells by a porous diaphragm; in one cell is placed dilute sulphuric acid, in which is immersed the zinc plate; in the other the sulphate of copper solution, in which the medal is placed—the zinc is oxidized, and for every equivalent of zinc which thus changes its form an equivalent of copper is deposited in the other cell.

The application of this process to covering articles with silver and gold depends on the same principle. If the article is to be covered with silver, the solution in which it is immersed is made from cyanide of silver dissolved in cyanide of potassium; a little sulphuret of carbon added to the solution prevents the chalky appearance, and gives the deposit the appearance of metallic silver. Electro-gilding is performed by a solution of oxide of gold in the cyanide, or ferro-cyanide of potassium. The voltaic battery has been generally employed for effecting the electro-chemical decomposition; but powerful magnets have also been employed with success as permanent sources of electricity. The strength of the solution is maintained by the suspension in it of a plate of gold, or silver, or other metal to be deposited. The metallic base of electro-plated articles is generally German silver, a hard, white metal composed of copper, zinc, and nickel; the figures being cast in white metal, which would otherwise be required to be cast in silver. The beauty of the articles, which may thus be reproduced at a trifling expense, is well illustrated in the goods displayed in the English Department, at No. 57.] (Figures of the articles, in silver and gilt plate, made by Mr. Ames, may be found on pages 157 and 171 of the Record.)

19. Bachman, Joseph, *New York City.*—Proprietor.
A model, in silver and gold, of the Dutch frigate Talerad, built in Amsterdam 200 years ago. This was made by H. Ries, and contains 22,000 pieces of silver and gold; valued at $300. It is supported by a silver figure.

20. Overbaugh, A. W., *Brooklyn, New York.*—Engraver.
Specimens of minute engraving on gold and silver coins; the "Lord's Prayer" upon a gold dollar and on a three-cent piece.

21. Hattersly & Dickinson, *Newark, New Jersey.*—Manufacturers.
Various specimens of fine plated Britannia ware.

22. Pincet, J., *New York City.*—Manufacturer.
A fire-gilded vase.

23. Crane, William H., *New York City.*—Manufacturer.
Gold leaf and gold foil for dentists and bookbinders, gilders and sign painters.

24. Kemp, William H., *New York City,*—Manufacturer.
Gold and silver leaf, and gold foil for dentists and bookbinders.

25. Hellman, W. H., *New York City.*—Manufacturer.
Samples of metal leaf and bronze powder.

26. Waugh, James L., *New York City.*—Manufacturer.
Gold leaf of two colors for gilders' use; gold foil for dentists; gold bronze.

27. Plant & Hooper, *New York City.*—Manufacturers.
Gold leaf and gold foil.

28. Wallace, J. & A., *New York City.*—Manufacturers.
Gold and silver foil.

29. Abbey, Charles, & Sons, *Philadelphia, Pennsylvania.*—Manufacturers.
Fine gold foil for dentists.

30. Ransley, Robert H., *Philadelphia, Pennsylvania.*—Manufacturer.
Gold leaf, gold foil, and gold bronze, made from California gold.

[This establishment gives employment to 28 workmen.]

[The great ductility of gold enables it to be brought to the condition of very fine leaves. An ingot of gold is first rolled to the thickness of about 1-800 of an inch; this strip is then hammered, membranes of parchment, vellum, and gold-beaters' skin being interposed between the hammer and the gold. One hundred and fifty pieces of the gold strip, an inch square, are beaten at a time until they have become four inches square; these are cut again into pieces an inch square, and again beaten till they are four inches square; a third beating of these pieces divided in the same way reduces them to the thinness of about the 1-300,000 of an inch, if necessary—one hundred square feet of the gold weighing only an ounce. The hammers weigh from ten to sixteen pounds, and the beating is effected on smooth blocks of marble. Silver is also beaten into thin leaves by hammering in the same way; but it can not be reduced to the extreme thinness of gold. Machinery is now substituted for hand labor in many of the processes of this manufacture.]

31. Marchand, Sen., Gaime, Guillemot & Co., *New York City.*—Manufacturers.
An assortment of fine jewelry.

32. Tice, William R., *Brooklyn, New York.*—Manufacturer.
A California gold ring.

33. Linher, C., & Co., *New York City.*—Manufacturers.
Hair bracelets, breast pins, rings, and watch chains, richly set in gold.

34. Carr, L., & D. S., *Providence, Rhode Island.*—Manufacturers.
Specimens of gold lockets.

35. Losskamp, Rosswog & Spies, *New York City.*—Manufacturers.
Jewelry in gold, pearls, and corals.

36. Smith, Deey & Eddy, *New York City.*—Manufacturers.
Gold lockets, chains, and breast pins; Ileiss's patent lever gold studs.

37. Stone, Weaver & Co., *Providence, Rhode Island,* and *New York City.*—Manufacturers.
Gold lockets and medallions.

38. Link, Robert, & Brothers, *New York City.*—Manufacturers.
Jewellers' hair work, as bracelets, guard chains, ear rings, crosses, brooches, and chains; pictures, devices, wreaths, and landscapes, wrought in hair, and richly set in gold.

39. Bagley, Josiah, *Cincinnati, Ohio.*—Manufacturer.
Pearl breast pin; agate rings; cannel coal ring; fancy baskets made from nuts and seeds of various kinds.

40. Bagley, A. G., & Co., *New York City.*—Patentee and Manufacturer.
Extension pen and pencil cases in gold and silver; gold pens of superior quality.

41. Beers, James B., *New York City.*—Manufacturer.
Gold pens, and gold and silver pencil cases.

42. Foley, John, *New York City.*—Manufacturer.
Iridium pointed gold pens of three sizes; gold and silver tipped pen holders of ivory and ebony.

[Iridium is a rare mineral found in combination with platinum and osmium, from which it is separated with difficulty. It is a very hard substance, being represented by 7, the diamond being 10.]

43. Piquette, C., *Detroit, Michigan.*—Manufacturer.
Desk and fountain gold pens.

44. Towers, W. H., *Philadelphia, Pennsylvania.*—Manufacturer.
Double-pointed gold pens, which may be used on either side; silver and other pen holders.

45. Appleton, Geo. S., *New York City.*—Publisher.
Medals of Webster and Clay in fine bronze.

46. Shaw, Joshua, *New York City.*—Manufacturer.
Mounted diamonds for glaziers' use.

47. Boland, Louis T., *New York City.*—Manufacturer.
Crests, coats of arms, and silver ornaments for harnesses.

48. Slocum, Franklin R., *Hartford, Connecticut.*—Manufacturer.
Gold and silver plated metallic daguerreotype cases.

49. Pittis, Thomas, *New York City.*—Manufacturer.
Engraved silver marking plates; brass plates, figures, and letters, stencil borders, and vignettes.

GREAT BRITAIN AND IRELAND.

50. Garrard, R. and S., & Co., *London.*—Manufacturers.
Specimens of rich silver ware, comprising a large silver table ornament, or candelabrum, for nineteen lights, in the peculiar style of the early Arabs, with group representing Saladin and Sir Kenneth halting at the fountain after the combat:

"They had now arrived at the knot of palm trees, and the fountain, which welled out from beneath their shade in sparkling profusion. Some generous or charitable hand, ere yet the evil days of Palestine began, had walled in and arched over the fountain, to prevent it from being absorbed in the rays of the sun, or choked by the flitting clouds of dust, with which the least breath of wind covered the desert."

Figured on page 80 of the Record. A sideboard ewer, with group representing

Indians hunting the bison in the prairies of North America; an embossed vine claret ewer.

Hexagon entrée dish, cover, and warmer.

Candelabrum for seven lights (Renaissance style).

Entrée dish, cover, and warmer (new pattern).

Claret ewer, after Cellini (from a copy of the celebrated Jug in the Vatican at Rome).

Group in silver, representing Arabs of the desert tracking travellers by their foot-marks in the sand. Modelled by E. Cotterill, Esq. (Figured in Illustrated Record, page 144.)

New pattern tea-service, consisting of tea-kettle, tea-pot, coffee-pot, sugar-basin, cream-ewer, and hot-milk-ewer.

Tea-salver, rosette and shell pattern.

Ewer in the style of the sixteenth century. Group: a knight, armed *cap-à-pie*, and mounted on his armored charger, having thrown his gauntlet, points at it in defiance of a rival; he is attended by his page and armor-bearer. (Figured in Illustrated Record, page 208.)

Dessert dish (pierced edge).

Silver-gilt mounted claret decanter, with richly chased stand, representing the Trumpet of Neptune.

A six-arm scroll candelabrum, with boys holding wreaths of flowers.

Dessert dish (Renaissance style).

Claret ewer, representing a nautilus shell supported by a mermaid.

Group in silver, representing the introduction of the Duchess, by Sancho Panza, to Don Quixotte, as the Princess Micomicona. Modelled by E. Cotterill, Esq. (Figured on page 81 of the Record.)

Tea-service (striped and chased Abercorn pattern), consisting of tea-kettle, tea-pot, coffee-pot, sugar-basin, and cream-ewer.

New pattern tea-salver, richly chased vine and mask border, with bacchanalian medallions.

Inkstand for the drawing-room or library, with richly chased marks of Holbein, Copernicus, Faust, and Erasmus.

New pattern spoons and forks (scroll panel and leaf pattern).

New pattern spoons and forks (horn pattern).

Models of the great Koh-i-noor diamond, in its original shape, as worn by its celebrated possessor, Runjeet Singh; and, also, as re-cut for Her Majesty, by the Messrs. Garrard, A. D. 1852.

[The diamond, in its pure state, consists of pure carbon, and is transparent and colorless; it is sometimes colored by foreign matters, as the oxides of the metals in very minute proportions. Diamonds are polished and cut by means of their own powder; split in their planes of cleavage, several natural facets may be produced; they are cut by means of an extremely fine wire coated with diamond powder. The principal sources of the diamond are India and Brazil; they are obtained by washing the earth where they are found. The largest diamond known to exist belongs to the Rajah of Mattan, in India; it is of the purest water, weighing 367 carats, or 3 troy ounces; it is egg-shaped; it was found at Ladakb over a hundred years ago. The next in size belongs to the Emperor of Russia, weighing 193 carats, of the size of a pigeon's egg. The Emperor of Austria possesses one of 139 carats, which, though of a yellowish hue, has been valued at $500,000. The Pitt, or Regent diamond, weighs 136¾ carats; and that of the Grand Duke of Tuscany 139 carats.

The Koh-i-noor, or Mountain of Light, was found, according to tradition, in the south of India, about 3000 years before the Christian era. It was said to be the property of the Rajah of Ujayin, from whom it descended to the Rajahs of Malwa, in whose possession it remained till 1306, when it became the property of the Sultan of Delhi; it appears to have remained in Delhi till the time of the Persian invasion in 1739, when Nadir Shah compelled Mohammed Shah, the great-grandson of Aurungzebe, to surrender it to him. Nadir Shah gave it the name of Koh-i-noor. After his death it became the property of Ahmed Shah, the founder of the Abdali dynasty of Kabul; it descended to his successors, and to Shah Shuja; when Shah Shuja was driven from Kabul, he became the actual prisoner of Runject Singh, who, in 1813, forced the fugitive monarch to give up the precious gem, presenting him at the same time with $60,000. From Runjeet it descended to his successors; after the murder of Shir Sing, it remained in the Lahore treasury until the annexation of the Punjab by the British Government; all the state property by stipulation was confiscated to the East India Company in part payment for debts due by the Lahore Government and of the expenses of the war; it was stipulated that the Koh-i-noor should be surrendered to the Queen of England, whose hands it finally reached July 3d, 1850. From this traditionary account little seems probable, except that the Great Mogul diamond and the Koh-i-noor are the same. In its original shape it weighed 186 carats.

(For figures of salver and centre-piece, see Record, pages 64 and 144.)

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51. Angel, Joseph, *London*.—Manufacturer.

Silver groups of Sir Roger de Coverley and the Gipsies, the Halt in the Desert, and Horse Trotting a Match. Tea and coffee sets, tankards, vases, dishes, cups, chalices, claret jugs, spoons, etc., in gold and silver plate; flowers made of the feathers of Brazilian birds. (See Illustrated Record, pages 18, 22, 28, 50, 113, and 157.)

J. Angel.—Silver Gilt and Enamelled Ware.

52. Skidmore, Francis, & Son, *Coventry, England*.—Manufacturers.

Sacrament service, antique chalices; and specimen of ancient binding in silver.

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53. Sharp, Thomas, *London*.—Manufacturer.

Silver cups and table centre-piece. (For figures of epergne, Shakspeare cup, and rich clock case, see the Record, pages 13, 22, and 27.)

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54. Society of Arts, *London*.—Proprietors.

The Swiney prize cup, in silver and gold, designed by D. Maclise, Esq., R. A., and executed by Messrs. Garrard, of London.

[The society periodically award, in accordance with the will of the late Dr. Swiney, similar prizes, with the sum of £100 sterling. The present cup is open to the competition of all nations, and will be conferred in January, 1854, on the author of the best treatise on Jurisprudence, relating especially to Arts and Manufactures, published previous to that date in the English language.] (For figure of this cup see page 13 of the Record.)

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55. Smith, Nicholson & Co., *London*.—Manufacturers.

Silver and electro-plated goods, candelabra, dessert-service. The Finding of Moses—in silver; Nautilus, supported by Sea-horses—in silver; Death of the Stag—in silver; Hunting in India; group of deer; candelabrum, electro-plated; gold and silver cups, salt dishes, and salvers.

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56. Hunt & Roskell, *London*.—Manufacturers.

Rich gold and silver ware and jewelry. Testimonials to Sir Moses Montefiore and

to Dr. Conolly: silver centre-piece; Elizabethan vase; a great variety of rich silver ware; diamonds and precious stones, and rich jewelry, of varied patterns and exquisite designs.

The central ornament (figured on page 126 of the Record) is adapted for a flower-stand by day and a candelabrum by night. On each corner of the plateau are groups representing the Seasons: Flora, with her Nymphs, and a lamb, personifying Spring; Zephyrs bearing on their shoulders a female figure, crowned with wheat and carrying the sickle, representing Summer; Autumn is typified by the figures of Silenus, Bacchus, and Pomona; Winter, by the aged Saturnus, who, seated on a leafless tree, spreads his mantel over shivering nature—on his left is a figure representing storms and tempests, accompanied by wolves. Beneath the groups are the signs of the Zodiac. At the foot of the centre ornament are figures representing the Quarters of the World, each represented by appropriate animals. The alto-relievo around the column represents Day and Night, attended by the Hours; and around the stem which supports the vase are four figures representing the Elements. The whole is decorated with ornaments of the cinquecento period. Designed and modelled by Alfred Brown.

A Testimonial, in silver, to Sir Moses Montefiore. The Sphinxes on which it rests indicate the Captivity of Israel in Egypt. The figures are Moses and Ezra, a Jew of Damascus, loaded with chains, and a released Jew; under each is an appropriate text in Hebrew, the vine and fig-tree overshadowing. A group on the summit represents David rescuing the Lamb from the jaws of the Lion. The bassi-relievi represent the Crossing of the Red Sea: Lawless Violence typified by Wolves Destroying the Flocks; Sir Moses and Lady Montefiore landing at Alexandria; Sir Moses obtaining the Firman from the Sultan; the Persecuted Jews of Damascus returning Thanks for their Deliverance; and Sir Moses, after his return, attending the Thanksgiving in the Synagogue. Designed by Sir G. Hayter.

(For figures of the Testimonial to Dr. Conolly, see page 79 of the Record; of Elizabethan silver vase, page 27; of wine cooler, vine vase, coffee-pot, cake basket, etc., pages 127 and 128.)

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57. Elkington, Mason & Co., *London and Birmingham.*—Patentees and Manufacturers.

Electro-plated goods: a large centre-table ornament, designed for the Exhibition; rock base, with oak branches supporting lights, and silver shells for fruit—the whole supporting a glass bowl for flowers; sea-tigers on the triangular base; flower stand—sea-horses and glass shell; tea services and kettles, rich Arabesque, old silver style, richly embossed, and richly chased; set of three centre pieces, Louis Quatorze.

Flower stand—shell, supported by coral and sea-weed.

Rich dinner service, consisting of dish covers, entrée dishes, soup tureens, wine coolers, etc., in the Arabesque style.

Set of three centre pieces, modelled from the Egyptian lily, or calla.

Tea tray, or salver—richly chased aquatic border, mythological border, Arabesque, Elizabethan.

Large centre piece for eight lights, in the style of the fifteenth century, with figures supporting baskets for fruit.

Venison dish and cover, Arabesque, with Gray's registered gravy well, for separating the fat from the gravy of roasted or boiled meats.

Two entrée dishes, covers, and warmers.

Pickle and cruet frames, Arabesque, richly pierced.

Claret jugs and wine coolers, of various designs.

Centre piece for dessert service, with figures of Winter and Summer.

Centre piece, or candelabrum, Oak Tree and Stags.

Compotiers for fruit, of various designs.

Centre-table ornament, the National Games of England.

Four smaller do. do. do.

Inkstands, Rebecca at the Well.

Flower stands, with Bohemian glass, of numerous designs.

Salt cellars, eagle supporting shell.

Spoons, forks, etc., of Elkington's new lily pattern.

Part of a service of plate, silver and gilt, comprising a dessert service, designed and adapted from the antique, by the Chevalier de Schlick.

Sideboard dish, in silver relief, gilt; subject from the "Illiad." Designed by Elkington, Mason & Co.

Set of three candelebra, after the antique.

Race plate, designed by Gunkel, modelled by Rossi, at Rome. The bas-reliefs on the frieze represent the three characteristic virtues of practical life, Strength, Swiftness, and Prudence. In the centre appears a mask of the fair Goddess of Love, who looks out from a rich Arabesque flower, as the incentive to every noble strife and the promoter of all prize competitorship.

Sideboard plate, representing the parable of the Prodigal Son, a reproduction by electro-deposition.

Fruit plate, in the Alhambra style.

Celebrated cup, an electrotype copy of, in pure silver, from the original one of Benvenuto Cellini, now in the British Museum.

A dish, of fine workmanship, obtained and copied for Messrs. Elkington, under the direction of Chevalier de Schlick; the eight subjects in bas-relief represent Minerva, Astrology, Geometry, Arithmetic, Music, and Rhetoric; the centre figure represents Temperance, surrounded by the four elements—as made, mounted as a table, for Queen Victoria.

Mirror, in oxidized silver, electro-gilt; purchased by Queen Victoria, at the Dublin Exhibtion; centre piece for flowers or fruit; electro-gilt and silvered, design taken from an antique tripod; cups and vases, beautifully copied, embossed with figures of Centaurs, ivy, and vine wreaths; electrotype copies of originals discovered at Pompeii and Herculaneum, and now in the Museum at Naples; plate, representing the seven days of the week, modelled by the Duke du Luynes; ink stands, the Slaughter of "Niobe;" and antique foot lamp, and one designed to commemorate the London Exhibition of 1851.

Electro-plate bronzes, representing Cupid with the Lyre, after Thorwaldsen; a dish, representing the Trojan Horse entering Troy, copy of a fine old silver chasing; vase, from original in British Museum; copy of celebrated Warwick vase; sideboard dish, subject from the Iliad, designed by the exhibitors; pair of lions, after Canova; Duke of Wellington, bronze bust by Weigall; busts of Homer, Sophocles, Aristotle, Demosthenes, &c., from antique sculpture; cup, the Apotheosis of Homer, from Pompeii; a pair of busts by Albert Durer.

[This patent was granted to Messrs. Elkington, in March, 1840, since which time the manufacture of articles by this process has become an important branch of industry, and is rapidly increasing. The patentees employ about 1,000 work-people, and, necessarily, some of the first designers of the day. The process is extensively adopted in foreign countries, and there are about thirty other manufacturers in England licensed to use it.

The advantages possessed by plating by this process, are:

1st. The application of a white metal, approximating to silver in color and hardness, as a base instead of copper, upon which the pure silver is deposited.

2d. The removal of all restraint as to form; the most elaborate ornaments, and the most complicated designs which can be produced in silver, are equally obtainable by this process.

3d. Permanency of plating, the coating of silver becoming, by the agency of electricity, one body with the metal on which it is deposited, rather than a mere covering.

4th. Economy in first cost and durability; in the multiplication of works of art of the highest character, this invention is now taking an important position; and the patentees have established a branch manufactory for such objects, and are now producing, with equal precision and perfection, copies from the smallest gem to the colossal statue, possessing all the accuracy and beauty of the original design.]

(For figures see page 126 of the Record.)

[In the process of plating *by fire*, a plate of silver, perfectly clear, is tied to an ingot of copper or German silver, having also a smooth surface; borax then being placed around the edges, they are submitted to the heat of an air furnace; during the union of the two bodies the surfaces are seen to be drawn into intimate contact, and this is the signal for removal from the furnace. The ingot is then rolled into sheets of the required thickness, according to the use to be made of it. The union of the two metals is so intimate that the finest wire, plated in the round ingot by fire, has been drawn out to five hundred times its original length without detaching the silver. It has been estimated that the value of the British-made plate used annually in Great Britain amounts to £1,200,000; the exports of plate, jewelry, &c., in 1849, amounted to £233,058.]

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58. Cox, John, & Co., *London* and *New York City.*—Manufacturers.
Silver-plated candelabra, table ware, tea-pots, &c.

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59. Penny, John, *London.*—Manufacturer.
Specimens of fine metal chasing and embossing.

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60. Leighton, John, *London.*—Manufacturer.
Shakspearian shield, illustrating the "Seven Ages of Man;" also specimens of a work of industrial art.

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61. Wiley, W. E., & Co., *Birmingham.*—Manufacturers.
Specimens of gold pens.

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62. Aaron, Brothers, *Torquay, Devon, England.*—Manufacturers.
Jewelry in malachite and silver.

[Malachite is a compound of carbonate and hydrate of copper.]

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63. Waterhouse, G. & S., *Dublin.*—Manufacturers.
A variety of copies of ancient Tara brooches, of Irish pearls and native gold of Wicklow; jewelry in malachite; the original Tara brooch found in Meath in 1850.

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64. Goggiv, Cornelius, *Dublin.*—Designer and Manufacturer.
Ornaments in Irish bog-oak, Killarney arbutus and yew, and Connemara marble, mounted in native gold and silver, with Irish gems and rock crystals—comprising bracelets, brooches, necklaces, ear-rings, studs, buttons, &c.

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65. Hermann, Augustus, *London.*—Manufacturer.
Hair bouquets, ornamented with pearls.

FRANCE.

66. Kirstein, F., *Strasburg.*—Manufacturer.
Silver alto-relievos and embossed work.

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67. Rudolphi, F. J., *Paris.*—Manufacturer.
Various objects in oxidized silver; bracelets and brooches; enamelled toilet vases; agate cup, mounted in silver; niello vases and fancy articles.

[In works of *oxidized* silver, instead of the usual polished or frosted appearance, the surface is left dull, having at first sight an unfinished appearance. The dark-colored silver is a most advantageous medium for the artist, as none of the spectator's admiration is wasted upon the brilliancy of the surface, as in ordinary works in silver. It is much used by the French in the manufacture of bijouterie. It is improperly called *oxidized* silver, the proper term being *sulphuretted* silver; the dull and dark color may be obtained by washing the surface with a solution of sulphuret of sodium or potassium, causing the formation of the sulphuret of silver. The art of enamelling is of great antiquity, and has always been in high esteem for the beauty, durability, and artistic finish of the objects produced by it. Enamel is a species of glass, colored by metallic oxides; the transparent kinds of enamel are used upon gold, as distinguished from the opaque enamel employed for watch-faces. *Niello* is a kind of enamelling known as early as the seventh century, and probably the germ of the art of engraving on metal plates; a niello is an engraved gold or silver plate, the lines of which are filled permanently with a black enamel; the art of damascening resembled niello, only that the engraved lines were filled with gold or silver. In the best period of the Florentine art, in the fifteenth century, niello was much employed in decoration, and many exquisite specimens exist in the museum at Florence. The enamel of niello was made of silver, copper, lead, and sulphur, with borax for a flux; the mixture was worked into all the lines of the engraved plate, and then subjected to a heat sufficient to fuse it; it flowed into every part, and traced the design in black upon a white or golden ground. A metallic deposit

may be introduced into the lines of the engraved design by the electrotype process; the raised metallic layer may then be ground down to the level of the plate, leaving the lines filled; by a selection of different metals very pretty designs may thus be made by a simple and cheap process.

Repoussé work, so called, is produced almost entirely by the hammer, being first beaten up from the back, and back again from the face, until the design of the artist is perfected. The electrotype process now enables us to copy *repoussé* originals, of great complexity of design, with perfect accuracy in the minutest details.] (For engravings of these objects see Illustrated Record, page 190.)

68. Odiot & Sons, *Paris.*—Manufacturers.
Table and tea services in various styles, with various specimens of silversmiths' work.

69. Veyrat, *Paris.*—Manufacturer.
Specimen of fine silver ware.

70. Desmoutis, Morin & Chapius, *Paris.*—Manufacturers.
Platinum still; cups, dishes, and crucibles, in platinum.

[Platinum is the heaviest substance known; it is extremely difficult of fusion; it undergoes no change from air or moisture, and is not attacked by any of the pure acids, though it is dissolved by chlorine and nitromuriatic acid, and is oxidized at high temperatures by pure potassa and lithia. The above qualities make it extremely useful to the chemist for cups and crucibles. It is found in the gold regions of California, and especially in the Ural Mountains, in Russia.]

71. Christofle, C., & Co., *Paris.*—Manufacturers.
A variety of electro-gilt and electro-silvered ware.

72. Lelong, *Paris.*—Importer and Manufacturer.
Imitation fine pearls.

[Pearls are formed by bivalve molluscs living in the waters of the East and West Indies; they are sometimes found free, but are generally attached to the inside of the shell; the name of the pearl oyster is *Meleagrina margaritifera*, of Lamarck. They may be produced by putting within the shell of the animal a foreign substance of the desired model, which will become encrusted with the pearly concretion.

Artificial pearls are made of globules of their glass, perforated like beads. The whiteness and iridescence of pearl is given to them by means of a liquor called "Essence of the East," which is prepared by throwing the brilliant scales of a species of blay, living in the Seine and the Rhine, into water of ammonia; the scales thus acquire a softness and flexibility which allow of their application to the inner surface of the globules, into which they are introduced by suction of the liquor which holds them in suspension. The glass should be of a bluish, opalescent color, and contain but little potash and oxide of lead. After the inside is thus covered, a coating of wax is added, which is colored of the required shade. Chinese pearls are made of a kind of gum, and are covered with the above nacreous liquid; Roman pearls are the same. Pearls are now made from an opaline, or pearly-colored glass, filled with gum instead of wax, which gives them greater transparency; the glaring, glassy surface is removed by the vapor of hydro-fluoric acid.]

73. Chapiseau, *Paris.*—Manufacturer.
Fancy boxes of various descriptions, trays, in white unoxidizable metal.

74. Villemsens & Co., *Paris.*—Manufacturers.
Altar crucifixes richly gilt; bronze candelabra, groups, lamps, and fancy articles; Cellini vases. (For figures, see the Record, pages 161, 174, and 175.)

75. Etex, *Paris.*—Manufacturer.
Various figures in bronze.

76. Lahoche, P. J., *Paris.*—Manufacturer.
Candelabra and lamps in porcelain and gilded bronze.

77. Hottot, H., *Paris.*—Manufacturer.
Bronzes, clocks, and statuary.

78. Barre, A., *Paris.*—Manufacturer.
A collection of bronzes and statuettes.

79. Duplan & Salles, *Paris.*—Manufacturers.
Statuettes, groups, candelabra, vases, lamps, lustres, inkstands, seals, and other articles in fine bronze, comprising the following works of J. Pradier: a "Woman Bathing;" the "Dolce far niente;" two Bacchantes, with cupids and satyrs at their feet; "Venus in a Shell." A collection of animals: the Virginia deer; the wounded deer; a deer attacked by a wolf; panther and stag; a family of bears; hawking; the wounded heron; horse attacked by wolves; Guinea fowl and pheasant. Penelope. Imitation bronzes from the antique; fine clocks; lamps in porcelain, bronze, papier-maché, copper, and bronzed tin. (For figures, see the Record, pages 157, 160, and 163.)

80. Arbanel, J., *Paris.*—Manufacturer.
A variety of fine bronzes; an ornamental door in cast iron, and heavily gilt. (Figured in the Illustrated Record, page 206.)

81. Drumier, Defevre, Madame, *Paris.*—Manufacturer.
Bronze busts and statuettes.

82. Ringuet, *Paris.*—Manufacturer.
A variety of bronzes.

83. Buhot, Charles, *Paris.*—Manufacturer.
Figure in fine bronze—"Sarah, the bather."

84. Weygaud, Auguste, *Paris.*—Manufacturer.
Figures, clocks, vases, candelabra, busts, &c., in fine bronze; chase of the wild boar; group of horses; Arab in ambush. (For figures, see Record, pages 45, 161, and 162.)

85. Lerolle, Brothers, *Paris.*—Manufacturers.
Candelabra, epergnes, vases, lamps, candlesticks, lustres, and other articles in bronze, comprising the following groups: "The Departure for the Chase," a large and beautiful vase, which may be used for a fountain; the group is composed of three children and a hunting dog; one of the children blows the horn, another holds the darts, and the third prepares the dog for the chase. This piece, sculptured by C. Lerolle, may be placed in the middle of the basin of a fountain, or on a pedestal, as an ornament for the garden or the saloon.

Vase of the "Sciences and Arts," of the style of Louis XVI., 70 centimetres in height; the bas-reliefs, one of which represents the Sciences and the other the Arts, were sculptured by Clodion.

Cup, with a group of children, about 40 centimetres high; it is supported by a circular group of seven children. Sculptured by François.

Candelabra, ornamented with Bacchantes, in the style of Louis XV., 1.30 metres high, intended for marble or bronze columns; the Bacchantes, sculptured by Canova, lean on a branch of foliage which supports fifteen candles, and surround them with their light; the two are intended to be placed opposite each other, and would ornament and illuminate the most elegant saloon.

Lamps of the Muses; gas carcel lamps, 66 centimetres high, supported by two muses, from the antique. Sculptured by Alphonse Lerolle, a young pupil of Pradier.

Clock, representing the "Conversion of the Saracen," and Moorish candelabra, of the Moorish style, about two metres high, of great purity of style and artistic finish; the gold, silver, and the bronze blend beautifully together, allowing occasional glimpses of fine blue enamel.

Lerolle, Freres.—Imitation bronze.

Lustre, representing "Night," supporting ten candles, each projecting from a poppy flower; the figure which represents "Night," spreads her mantle over the earth, which is of blue enamel studded with golden stars; intended for suspension in a small saloon, boudoir, or lady's chamber.

Table ornaments, gigantic clock, Venus' toilet, porcelain vases, mounted on gilt bronze. (For figures, see Record, pages 45, 48, 49, 81, 113, and 160.

86. Laureau, *Paris.*—Manufacturer.
Bronzes and ornamental clocks.

87. Cordier, *Paris.*—Manufacturer.
Bronze candelabra and other objects; Chinese man and woman; negro and negress, busts in iron, of natural and miniature sizes.

88. Duval & Guerafeid, *Paris.*—Manufacturers.
Bronzes and clocks.

89. Foyatier, *Paris.*—Manufacturer.
Bronze equestrian statuette, Joan of Arc.

90. Bonheur, *Paris.*—Manufacturer.
A collection of bronzes.

91. Fremiet, *Paris.*—Manufacturer.
Groups in bronze and plaster; fine plaster group of cat and kittens.

92. Guebhard, P. F., Jr., *Paris.*—Manufacturer.
Articles in copper, gilt by electro-galvanic process.

THE GERMAN STATES.

93. Volkamers, H. P., Jr., & Fursten, *Nuremberg, Bavaria.*—Manufacturers.
Gold leaf and foil; tinsel and tinsel ornaments.

94. Schaftag, J. C., *Nuremberg.*—Manufacturer.
Gold, half gold, and silver leaf.

95. Brandeis, J., *Fürth, Bavaria.*—Manufacturer.
Gold leaf and gilding materials.

96. Bauer, W. W., *Nuremberg.*—Manufacturer.
Gold and silver tinsel and tinsel goods, and spangles.

97. Aurnhammer, Brothers, *Frenchflingen, Bavaria.*—Manufacturers.
Gold and silver tinsel goods.

98. Scheiblein & Son, *Weissenberg, Bavaria.*—Manufacturers.
Gold and silver tinsel goods.

99. Henninger & Co., *Berlin.*—Manufacturers.
Silver plated goods.

100. Birkner & Harbmann, *Nuremberg.*—Manufacturers.
Gold and silver leaf; silver, gold, and bronze powder.

[Bronze powders are prepared in various ways; some of them mechanical and some chemical. Dutch metal and mosaic gold are ground to powder; copper is precipitated by clean iron from a solution of the nitrate of copper; it is then dried and heated to different degrees, producing different colors according to the degree of oxidation. Plumbago, cinnebar, and other metallic colors, are mixed with the bronze powder to produce variety of tint.]

101. Merkel, Frederic, *Schwalbach, Bavaria.*—Manufacturer.
Specimens of Leonischen wire, or "threads."

102. Kuhn, E., *Nuremberg.*—Manufacturer.
Gilt and silvered wires of various sizes; gold and silver thread for spinning.

103. Kaufmann, J. L., *Nurenberg.*—Manufacturer.
Brass and steel, and gilt wire.

104. Friedman, Joseph, *Frankfort-on-the-Maine.*—Manufacturer.
Specimens of fine jewelry.

105. Sachs, Edward, *Stuttgard, Wurtemberg.*—Manufacturer.
Specimens of jewelry in gold and precious stones.

106. Ott, Nicholas, & Co., *Gmünd, Wurtemberg.*—Manufacturer.
Specimens of fine jewelry.

107. Haulick, G., Frederic, *Hanau, Hesse-Cassel.*—Manufacturer.
Flower in brilliant and rubies, with leaves of emerald and green enamel, in a vase of gold and enamel. The flower can be detached in the middle of the stem, and be used as a brooch or hair pin.

108. Erhard & Co., *Gmünd, Wurtemberg.*—Manufacturers.
Cheap jewelry and church ornaments.

[Some of the compounds used in the manufacture of imitation jewelry are: *Monheim's gold*, an alloy of 3 parts copper, 1 part zinc, and a little tin; if the metals are pure, the alloy bears a very close resemblance to gold. *Pinchbeck*, 5 parts pure copper, 1 part zinc. *Princess metal*, 3 parts copper, 1 part common brass, and a little zinc. *Artificial gold*, 16 parts platinum, 7 parts copper, 1 part zinc, melted together. *Fahlun brilliants* are made of 29 parts tin and 19 parts lead; a very fusible and brilliant alloy. *Queen's metal*, imitating silver, has a fine lustre; it is made of 9 parts tin, 1 part lead, 1 part antimony, and 1 part bismuth. *Ormolu*, or *mosaic gold*, is made of equal parts of copper and zinc. A common composition for trinkets is 75 parts gold, 25 parts copper, and a little silver.

109. Haehn, A., *Idar, Oldenburg.*—Manufacturer.
Articles of agate.

110. Hern, J., *Oberstein, Bavaria.*—Manufacturer.
Agate candlesticks.

111. Sax & Co., *Waldkirch, Baden.*—Manufacturers.
Bohemian and Oriental garnets, rubies, &c.

THE AUSTRIAN EMPIRE.

112. Bobzani & Co., *Vienna.*—Manufacturers.
Gold chains, seals, keys, pencils, and silver snuff-boxes.

113. Schoeller, Alexander, *Berndolf, Austria Proper.*—Manufacturer.
Samples of German silver and silver-plated table furniture.

114. Begman, Max., *Vienna.*—Manufacturer.
Specimens of gilded jewelry.

115. Petrowitz, Demeter, *Vienna.*—Manufacturer.
Cast medallions.

THE ITALIAN STATES.

116. Capello, Brothers, *Turin, Sardinia.*—Manufacturers.
Specimens of richly chased and enamelled articles in gold, silver, and precious stones.

117. Bennati, Guiseppe, *Genoa, Sardinia.*
Statue in silver filligree-work, representing Christopher Columbus.

[This kind of work is made from delicate threads of gold or silver wire; the filaments are braided and festooned in various ways according to the design of the artist, and with a very light and beautiful effect. This ancient art was brought into Europe from the East. The Hindoos, Malays, and Chinese make a great deal of this work with very rude implements; it is now generally neglected in Europe.]

118. Montefiori, C., *Turin, Sardinia.*—Manufacturer.
Silver plate, encased in alto-relievo, with the portrait of the Queen of Sardinia.

119. Thermignon, Pietro, *Bessans (Savoy), Sardinia.*—Manufacturer.
A figure of the Saviour, *Descent from the Cross*, in chased silver; a pontifex, in gold and silver, chased and enamelled; breast pins in gold, set with pearls and precious stones.

120. Bonavati, A., *Turin.*—Manufacturer.
A vase for holy water.

121. Poggi, Antonio, *Genoa.*—Manufacturer.
A variety of exquisite articles of coral.

122. Rafaelli, P., & Son, *Leghorn, Tuscany.*—Manufacturer.
Coral ornaments.

123. Muzzarelli, C., *Bologna.*—Manufacturer.
Rose-colored coral ornaments; specimens of medals.

124. Demarini, G. B., *Genoa.*—Manufacturer.
A set of rose-colored coral ornaments.

125. Bussi, G., & Co., *Turin.*—Manufacturer.
A parure of pearls and brilliants in silver mounting; a magnificent brooch in enamelled gold and brilliants.

126. Bosi, Enrico, *Florence.*—Manufacturer.
Brooches and bracelets in Florentine mosaic.

127. Casali, F., *Rome* and *New York City.*—Manufacturer.
Cameos cut on shells; Theseus and the Centaurs; Hercules; the Muses; heads of Salvi, Garibaldi, Avezzana, &c.

[Cameos are bas-reliefs on a small scale. Stone cameos are cut from varieties of the agate, cornelian, onyx, and similar minerals. Shell cameos are made from marine shells, as conch shell, Tritons, &c.; the material being softer, such works are easily executed by steel instruments. Cameos are also cut from lava; in fact, the name is applicable to any small bas-relief, in whatever substance it may be cut.]

128. Papi, Clemente, *Florence.*—Manufacturer.
Cast, in bronze, from a specimen of the *crassula portulacoides*, in a bronze vase; cast, in bronze relievo, of a wild boar's head attached to the branch of an oak; Venus and Cupid in a conch shell; a fountain, in bronze—exhibited as specimens of casting by a new method, and not as works of art. (For figures of first two, see the Record, page 28.)

SWITZERLAND.

129. Dubois, Adolphe, *Chaux de Fonds, Canton Neuchatel.*—Manufacturer.
Engraving on gold.

130. Derriey, J., *Geneva.*—Manufacturers.
Two enamelled paintings on gold, and two tea services of silver, richly chased and ornamented.

131. Perrenond, H. V. Grandjean, *Chaux de Fonds.*—Manufacturer.
Two gold plates, engraved.

132. Kundert, Fritz, *Chaux de Fonds.*—Designer and Manufacturer.
Watch cases, engraved with historical subjects.

133. Bernard & Moulinié, *Geneva.*—Manufacturer.
Watch cases, richly engraved; enamelled watch faces.

134. Leresche, A., Golay, *Geneva.*—Manufacturer.
A variety of rich jewelry.

135. Terond, Ravier & Co., *Geneva.*—Manufacturers.
Various articles of fine jewelry; bracelets.

136. Dutertré, Auguste, *Geneva.*—Manufacturer.
Various specimens of elegant jewelry, bijouterie, and watches.

137. Bachelard, D., & Son, *Geneva* and *New York City.*—Manufacturers.
Specimens of fine jewelry.

138. Capt, Henry, *Geneva.*—Manufacturer.
An extensive assortment of elegant jewelry and gems.

139. Nicolet, A., *Geneva.*—Manufacturer.
Engraved tablet in silver.

THE NETHERLANDS.

110. Meyey, P. de, *Hague.*—Designer and Manufacturer.
Silver cup, representing the Triumph of Neptune; silver urn, and other embossed silver ware.

111. Grebe, J. G., Jr., *Rotterdam.*—Manufacturer.
Embossed silver beaker, hammered out of one solid piece.

[The art of chiselling in the precious metals was formerly practised with great success in the Netherlands; indeed, this country surpassed all other nations at that time in such works, as may be seen from the plates of a rare work, entitled "Artificial Models of different Vessels and other Works, designed and made by the celebrated Adam van Vianen." These articles were principally hammered by him out of a single lump of silver; the plates were engraved by Theodore van Kissel, and published by Christian van Vianen (the son), of Utrecht; he lived in Utrecht in 1630, and the works still preserved justify fully the admiration bestowed on them in the first half of the seventeenth century. In the collection of Mr. Schinkel, at the Hague, are still to be found some has-reliefs by this master, or one of his sons of the same name, who inherited the skill of his father. This art afterwards fell into disuse, in which it remained till the prize offered by the Royal Institute in December, 1836. Mr. Grebe, stimulated by seeing the works of the Van Vianens, aimed to revive the art, and surmount the difficulties attending the hammering from a single piece of what is usually made by soldering many cast and wrought pieces. The result of his trial was this fine goblet. The bottom of the plate was taken out in order that all the parts might be reached by the tools. The difficulties attending this work must have been very great, as the chiselling of the little feet of the figure in the lying posture, the obtaining the width of the tree with that of the standing figure, the drawing out the head of the climbing figure where the object has a cavity or hollow, and the hammering out on the goblet two figures opposite each other, in which a round object tends to extend itself into an oval. The style of the goblet is one of the maker's creation, and not an imitation of any country's design.]

112. Grevink, G., *Amsterdam.*—Manufacturer.
Silver-plated ware.

113. Presburg, M. J., & Co., *Nymegen.*—Manufacturers.
Silver and copper polished snuff boxes and spectacle cases.

SECTION III. CLASS XXIV.

MANUFACTURES OF GLASS.

THE display of glass manufactures in the New York Exhibition did not correspond with their extent and importance. The principal contributors on the American side were the Brooklyn Flint Glass Company, and the New England Glass Company of Boston. They are the largest manufacturers of this kind of glass, and their exhibition of dioptric lenses and signal lamps, and of plain, pressed, cut, and decorated ware, was highly creditable. American flint-glass is distinguished for its pure color and brilliancy. Pressed glass is an American invention, and it was only in 1837 that drinking-glasses were first made by this process.

A few contributions in this class were made from England; the most noticeable were stained glass windows. Optical glass, of the finest quality, and very rich examples of ornamental glass, were exhibited from France.

A full, though condensed account of the history and methods of manufacturing glass, and an essay on the art of glass-staining, may be found in the "ILLUSTRATED RECORD," pages 29 and 150.

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1. BROOKLYN FLINT GLASS COMPANY, *Brooklyn, New York.*—Manufacturers.

An assortment of plain, cut, and pressed glass ware; dioptric lenses and signal-lamp glasses, for railways, ships, &c.

[The purity of the sand, for glass-making, exhibited in the American department, is most remarkable; it is as white as snow, and perfectly pure. Most sands have a yellow color, indicating oxyd of iron, which imparts the green tinge to common glass, which it is the purpose of manganese to prevent. It may be worth while to know how to remove this oxyd of iron in an economical and effectual manner. When sand containing oxyd of iron is mixed with a little charcoal, and subjected, at a red heat, to the action of chlorine gas, the whole of the iron is volatilized, as chloride of iron, and the silica remains pure as soon as the excess of charcoal has been burned off. It is not improbable that the muriatic acid, so incessantly wasted in our soda-works, may be used for purifying glass-makers' sand; at ordinary temperatures this would probably remove the oxyd of iron, and it certainly would by the application of a little heat.]

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2. NEW ENGLAND GLASS COMPANY, *Boston, Massachusetts.*—Manufacturers.

One set (four pieces) cut scroll-pattern decanters.
One set (in part) Cambridge pattern-cut glass, sixty-four pieces.
One set (in part) Boston pattern-cut glass, fifty-eight pieces.
One pair cut block-diamond double-lip wine bottles.

This ware was not made for exhibition, but taken from the shelves of the ware-room merely to show the style and quality of the cutting turned out by this factory. We had no entire sets on hand.

130 pieces pressed sharp diamond-pattern glass ware, consisting of bowls, tumblers, goblets, champagne, wine, and jelly glasses.
Two 9-inch pressed bowls.
Eleven plated and cut double-lip hock-shape colognes.
Five plated and cut salts.
One plated and cut goblet, cut in relief.
Three plated and cut water-bottles, tumblers, and stands, for the toilette.
One globe on foot, plated green, and cut.
Three large silvered-glass vases.
One silvered-glass pyramid.
One silvered-glass druggists' show-bottle.
One 10-inch silvered-glass globe on foot.
Two 10-inch silvered-glass bowls on foot.
Two silvered-glass goblets, engraved.
One large silvered-glass bowl on foot, very richly engraved.
Three plated-glass goblets, cut and silvered.
One glass pyramid, plated, cut, and silvered.
One glass globe on foot, plated, cut, and silvered.
Two hundred glass door-knobs, silvered.
Two plain-flint goblets, engraved.
One square toilette, or cologne bottle, engraved.
Twenty-three articles of glass, representing apples and pears.
Twenty paper-weights of same design.
Nine fancy paper-weights.
Six fancy paper-weights, fruit-center.
Twenty-eight fancy paper-weights, cut.
One plain paper-weight, engraved stag.
Six fancy paper-weights, cut and gilded.
One set plated, cut, and gilded toilette water-bottle, tumbler, and stand.
One pair blue-plated, cut and gilded, hock-shape, double-lip wine-bottles.
One pair opaque, white-plated, cut and gilded, double-lip wine-bottles.
One enameled glass smoke bell, gilded leaves.
Four enameled glass smoke bells, richly ornamented with painting and gilding.
One bottle protoxyd of lead, or massicot, for glass-makers.
One bottle red lead for glass-makers.
One bottle common red lead.
One bottle common litharge, manufactured from Soft Upper Mines; Missouri pig lead.
One bottle pure carbonate of potash, prepared from pearl-ash.

[The foregoing articles are manufactured by the New England Glass Company, of Boston, established and incorporated in the year 1818. The factory is located at East Cambridge, about one mile from the city of Boston, and employs upwards of 480 hands.]

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3. STOUVENEL, JOSEPH, & BROTHER, *New York City.*—Manufacturers.

Cut crystal goblets, bowls, celery-dishes, pitchers, wine-glasses, and other articles.

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4. BAKER & BROTHER, *Baltimore, Maryland.*—Manufacturers.

Druggists' glass ware, of all descriptions; preserve and pickle jars, flasks, window-glass, ink-bottles, wine-bottles, &c.

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5. BERGER & WALTER, *New York City.*—Manufacturers.

Watch-glasses of all styles; clock-glasses; rich cut decanters, goblets, wine-glasses, tumblers.

[All that the glass-blower does, towards making watch-crystals, is, to blow regular hollow spheres, about eight inches in diameter, very thin, and weighing twelve ounces. These are immediately given to the watch-glass maker, without being annealed, or gradually cooled. The sphere is divided into as many as possible sections of the requisite size, which is done by tracing, and afterwards wetting a line, in which the glass will crack very precisely. Before these pieces can be made to assume the

necessary convexity, they must be softened by heat; they are then pressed easily into the convex form, by an appropriate instrument; the edges are then ground. Lunette glasses are not segments of spheres, but have their edges abruptly raised, and the interior area flattened; they are blown in a pear-shaped figure, whose largest end is of the size required for the watch-glass, and the requisite flatness is given by pressing this end, while soft, on some smooth level surface.]

6. Bodine, G. M., *New York City.*—Manufacturer.
Lunette watch-crystals, of superior strength, temper, and finish.

7. Bolton, John, *Pelham, New York.*—Manufacturer.
Richly stained mosaic window, with scriptural studies and emblems. Specimens of illuminated lettering on glass.

8. Brandon, A. & G., *New York City.*—Manufacturers.
Gold lettering on glass.

9. Hale, Frederick, & Co., *New York City.*—Manufacturers.
Enameling and writing on glass in burnished gold. Druggists' show-jars, &c.

[Enamels, applied to glass, are composed of a metallic base or oxyd, in connection with a flux, or glass which melts at a lower temperature; they are ground upon a glass slab, with a muller, in some essential oil, and are applied with a brush. As the color is apt to be lost if the heat be too great, an exact knowledge of the requisite amount of heat is necessary for success.]

10. Cooper & Belcher, *Camptown, New Jersey.*—Manufacturers.
New machine-engraved and etched ornamental window-glass (exhibited in the west gallery windows) of five patterns.

11. Hannington, William J., *New York City.*—Manufacturer.
Stained glass gothic windows; stained glass plates, panels, borders, for windows and doors. Stained glass portraits and fancy subjects. [For an article on glass-painting, see the Record, page 29.]

12. Smith, Philip, *New York City.*—Manufacturer.
Plate of ruby glass, cut with designs representing the arms of the United States.

13. Sharp & Steel, *New York City.*—Manufacturers.
Stained glass, in ancient and modern styles.

14. Stephenson, Matilda C., *East Brooklyn, New York.*—Manufacturer.
Stained and painted glass, representing various scriptural subjects, of very elaborate designs.

15. Bidwell, H. L., *Hartford, Connecticut.*—Exhibitor.
Skylight with stained glass, painted by W. J. Hannington.

16. Collins, E. K., *New York City.*—Exhibitor.
Stained glass picture, "Naval Engagement," painted by Hannington.

GREAT BRITAIN AND IRELAND.

17. Breffit, Edoar, *Yorkshire.*—Manufacturer.
Specimens of glass bottles of various kinds, with patent stoppers; glass insulators for electric telegraphs, &c.

[Bottle-glass is the cheapest kind, and made of ordinary materials; these are generally sand, with lime, and sometimes clay, and alkaline ashes of any kind; the green color is owing to impurities in the ashes, generally to oxyd of iron. This glass is hard, strong, and less subject to corrosion by acids than flint-glass. For bottles containing the effervescing wines, great care is necessary in the making; the materials must be thoroughly mixed, when the mass is in a state of fusion, and the thickness should be uniform throughout, in order to resist the pressure of the contained carbonic acid. The loss of bottles by bursting, in the champagne trade, is from twenty to thirty per cent.; a machine has been contrived to test their strength, which ought to be equal to bear the pressure of from twenty-five to thirty-five atmospheres. In bottles intended to contain acids, the alkali and the lime should be chemically united, to prevent their being acted upon by the acid.]

18. Apsley, Pellatt & Co., *London.*—Manufacturers.
Elegant cut-glass chandeliers, of various styles.

19. Ross, O'Connor & Co., *Dublin.*—Manufacturers.
Watch-glasses in their various stages of manufacture.

20. James, William Henay, *Camden Town.*—Inventor and Designer.
Window-glass ornamented by machinery.

21. Bland, Samuel K., *London.*—Designer and Manufacturer.
Enamel-painted windows, with original style of chromo-crystal decorations.

22. Frewin, James, *London.*—Manufacturer.
Stained glass window—subject, "The Angel delivering Saint Peter out of prison," after Rubens.

23. Holland, William, *St. John's, Warwick, England.*—Manufacturer.
Stained glass windows, and imitation inlaid marble in glass plate. [For represen tations of some of these, see the Record, pages 21 and 82.]

FRANCE.

24. Van Leempool de Colnet & Co., *Quinquengrogue Glass Works, near Chapelle Nisne.*—Manufacturers.
Bottles of various sizes and qualities, for all purposes.

25. Berger-Walter, *Paris.*—Manufacturer.
Crystal and porcelain door and draw knobs, mounted in various styles, and of all colors, the products of the Moselle Glass Works.

26. Laboche, *Paris.*—Manufacturer.
Richly cut and engraved glass ware for the table.

[Engraving on glass is made by small revolving copper-wheels upon a lathe, of which the spindle revolves very rapidly; by touching the wheels with emery and oil, the glass is cut with great ease. Many ornaments thus produced are exceedingly beautiful and costly. A very pure and well-annealed material is requisite for delicate outline and deep cutting.]

27. Auzou, Jr., *Havre.*—Manufacturer.
Specimens of round glass demijohns, in wicker cases.

28. Vicart, L., & Co., *Graville, Seine Inférieure.*—Manufacturers.
Specimens of demijohns and other glass bottles, of various shapes, in osier baskets.

29. Guerhard, P., & Co., *Paris.*—Manufacturers.
Various specimens of hand-mirrors.

30. Cirey & Montherme, *Paris.*—Manufacturers.
A large mirror.

31. Maes, L. J., *Paris.*—Manufacturer.
Vases of pure and fancy-colored crystal cologne and essence bottles; fancy paper-weights of crown-glass; object-glasses for daguerreotype cameras; cut-glass of various kinds; glass door-plates and door-knobs; vinaigrettes, and various ornaments. [For descriptions and figures, see the Record, page 108.]

[The difficulty in the construction of large achromatic lenses has always been the want of homogeneity in the structure of the glass. The specimens exhibited by Mr. Maës are remarkably brilliant, pure, homogeneous, and free from striæ. In the manufacture of his glass, he uses the oxyd of zinc instead of the oxyd of lead, with boracic acid, which renders fusion and vitrification much easier. The boracic acid is comparatively expensive, and this glass has not stood, as yet, sufficient time to determine its real value; but the glass promises, thus far, to be of very great value for optical purposes, and the low dispersive power of the zinc compounds will probably cause it to be substituted with advantage for crown-glass. The borate of lime, or hayessine, found abundantly on the west coast of America, will doubtless prove of great value in the manufacture of glass.]

32. Fialeix, *Marget, Seine Inférieure.*—Manufacturer.
Specimens of painted glass.

33. Vallet & Co., *Forbach.*—Manufacturers.
Specimens of stained glass, in a variety of colors.

THE GERMAN STATES.

34. Derudinger, J. A. Sohler & Co., *Offenburg, Baden.*—Manufacturers.
Plain and fancy window-glass; colored and embossed glass; drawings on glass, one representing a scene from the life of Columbus.

[The Germans have always excelled in the manufacture of colored glass; their products are superior as to color, artistic form, and ornament. The Zollverein exports exceed the imports by the amount of nearly 700,000 thalers yearly; the exports consist principally in plate and concave glass, as well as in colored, ground, and fancy-gilt glasses; the glass for the chemical, physical, and pharmaceutical arts, is of the best quality.]

35. Krautz, J. H., *Neumarkt, Silesia.*—Manufacturer.
Glass buttons, beads, hair-pins, &c.; and colored ornaments.

36. Mittelstadt, W., *Zirke, Posen.*—Manufacturer.
Specimens of glass ware, chiefly plain.

37. Sohn's, Count, Glass Works, *Baruth, near Berlin.*—Manufacturer.
Samples of colored glass and glass ware; opaque white.

38. Benedict, M., Jr., *Fürth, Bavaria.*—Manufacturer.
Looking-glasses in various styles of manufacture.

[Plate-glass for mirrors may be blown in cylinders, when they do not exceed four feet in length; but, of a much larger size, they may be made by *casting*, which is the only way of producing very large plates. The melted glass is poured upon tables of polished copper, having a rim as high as the intended thickness of the plate; to make the surfaces parallel, a heavy roller is passed over the plate, resting on the rim, which presses down the glass which is beginning to grow stiff, and drives before it any excess of material. The plates, after being annealed, are ground and polished by a process very similar to that used in polishing marble. For economy of material, the glass is commonly ground with pure flint, reduced to powder.]

39. Vetters, E. G., Jr., *Lauschau, Thuringia.*—Manufacturer.
Imitation-agate marbles in glass; glass eyes for birds and dolls, and various fancy articles in glass.

40. Heilbronn, Leopold, *Fürth, Bavaria.*—Manufacturer.
Glass plate for mirrors, silvered.

41. Seidel, Franz, *Greuzdorf.*—Manufacturer.
Beads, and ear-rings of glass, variously colored.

42. Faost, W., *Nuremberg, Bavaria.*—Designer and Manufacturer.
Vine paintings on glass.

43. Wagner, J., *Kirschberg, Baden.*—Designer and Manufacturer.
Paintings on glass.

44. Voot.—Manufacturer.
Paintings on glass.

BELGIUM.

45. Capellmans, T. B., *St. Vaast, Hainault.*—Manufacturer.
An extensive assortment of fine glass ware; wine-glasses, decanters, vases, dishes, and other table-furniture; glass shades and chimneys for lamps.

46. Daubresse, Brothers, *Louvière.*—Manufacturers.
Specimens of window-glass, of large size and fine quality.

THE AUSTRIAN EMPIRE.

47. Batka, Wenzel, *Prague, Bohemia.*—Manufacturer.
Retorts, tubes, flasks, jars, &c., for chemical uses; models of crystals.

48. Wetzstein, Vincent, *Prague.*—Manufacturer.
Exquisite table-ornament of polished rock-crystal.

49. Scheiffle, G. S., *New York City.*—Importer.
A great variety of Bohemian glass ware.

[The manufacture of glass is one of the oldest and most extensive branches of industry in Bohemia; this country supplies more than half of what is produced in the Austrian Empire, and has long carried on an extensive trade with all parts of the world. In 1847, there were exported of hollow and table glass, 102,119 cwt.; of cut and cast crystal-glass and mirrors, 23,075 cwt.; of beads, artificial gems, &c., 5,619 cwt.; of this amount, in each class, Bohemia contributed 88 per cent. The consumption of these articles at home is nearly equal to what is exported. The Venetian provinces make large quantities of beads, many of which are partly cut in Bohemia. By the adoption of the best processes, by the richness of the raw materials, and the cheapness and elegance of the manufactured articles, Bohemia has secured the best foreign markets, hitherto without danger of competition. The extensive collections displayed in the Exhibition, sufficiently attest the beauty, excellence, and variety of the universally known "Bohemian glass ware."]

50. Stainer, E., *New York City.*—Importer.
A variety of Bohemian glass ware; vases, glasses, cups, pitchers, bottles, &c. [For figures and descriptions, see Record, p. 109.]

51. Pazelt, A., *Turnan, Bohemia.*—Manufacturer. (Agents, Knauth, Nachod & Kuhne, *New York.*)
Assortment of artificial stones of cut glass.

52. Feilhammer, F. A., *Brünn.*—Manufacturer.
Specimens of lettering on glass.

53. Richter & Franké, *Mariahelf, near Vienna.*—Manufacturers.
Fancy articles made of glass.

54. Blaschka & Sons, *Liebenau, Bohemia.*—Manufacturers.
Beads, glass buttons, luster pendants; breastpins, ear-rings, in variously colored glass.

55. Keil, Joseph, *Gablonz.*—Manufacturer.
Glass buttons and beads.

56. Helmich, F. A., *Wolfersdorf, Vienna.*—Manufacturer.
Samples of glass beads.

57. Kanitz, C., *Vienna.*—Exhibitor.
Colored and enameled glass beads, bugles, brooches, and other ornaments. Colossal luster-pendant in case; other glass ware, fine and clear; glass pens, soft and hard.

58. Giacomuzzi, J., & Brothers, *Venice.*—Manufacturers.
Mosaic tables—one an exact copy of a piece of pavement in the Basilica of St. Mark's at Venice. Enameled work corals, glass imitation-pearls, and beads variously colored. [For an article on mosaics, and figures, see the Record, page 83.]

[There is nothing peculiar in the composition or preparation of the colored glass used in making beads. When one workman has blown the colored glass into the usual hollow form, a second takes it at the other end, and the two then run in opposite directions, drawing the glass into a pipe, or tube, whose caliber bears the same proportion to the substance of the glass as was first given by the blower. The tubes are sometimes drawn 150 feet in length. When the tube is sufficiently cool, it is divided into equal lengths, which are afterwards cut into pieces sufficiently small to make beads. The pieces are then thrown into a mixture of sand and ashes, that their tube, by stirring, may be filled, to prevent the sides from coming together by the heat to which they are afterwards subjected. They are then heated, with more ashes and sand, over a charcoal fire, and continually stirred; by this simple means, they assume the globular form. They are then freed from the sand and ashes, and transferred to sieves, which divide them according to size.]

THE NETHERLANDS.

59. Bylart, J., *Utrecht.*—Manufacturer.
Specimens of glass ware.

60. Society, Netherlands, for Window Glass, *Zwyndrecht, near Dodricht.*—Manufacturers.
Glass cylinders and window-glass.

61. Nievergelt, J. R. F., *Hague.*—Manufacturer.
Electro-coppered glass stills and porcelain vessels.

[Vessels thus coated accelerate solution and distillation, and require the minimum heat to conduct these processes; while the copper, conducting the heat equally over the surface of the glass, preserves it from fracture by unequal expansion, and at the same time protects it from external accidents. This covering was first exhibited at the Paris Exposition of 1844, where it attracted great curiosity. The coating is smooth, perfect, and uniform, and is obtained by the electrotype process. The surface of the glass or porcelain is first varnished, then brushed over with bronze-powder, in order to form a conducting surface on which the copper may be deposited, and the vessel is then placed in the decomposition-cell, in connection with the battery. In a few days the whole external surface is covered with bright metallic copper.]

SECTION III. CLASS XXV.

CERAMIC MANUFACTURES.

THE contributions of porcelain, and other ceramic manufactures, were scanty indeed in the American quarter of the Exhibition; for, as yet, this beautiful branch of art-manufacture has only begun to be established among us. But the display from England and France was one of the most remarkable features of the place, and must have been a novel and instructive spectacle to all who had not visited the national museums of Europe. To develop this art, costly experiments have been carried on for a century and a half, at the expense of several of the governments of Europe; and the result has been so successful in France that the refinements of modern art and the triumphs of modern science are nowhere exhibited more advantageously than in a Sèvres vase.

The specimens from the great manufactories of England were very numerous, and the majority possessed great beauty. The English contributions were chiefly admired for the statuettes in Parian. A short account of the manufacture of porcelain may be found in the "ILLUSTRATED RECORD," page 188, and engravings of the best examples have been published in the same work.

1. UNITED STATES POTTERY COMPANY, *Bennington, Vermont.*—Manufacturers.
Fenton's patent flint enameled ware. [For representations of pitchers, &c., see pages 78 and 79 of the Record.]

2. HAUGHWOUT & DAILEY, *New York City.*—Decorators.
Dessert and toilet sets, vases, coffee cups, and plates of fine porcelain, richly decorated with landscapes, figures, flowers, &c. Specimen plate, with blue band, Alhambra style, of a dinner service manufactured for the President of the United States. [Figured on page 129 of the Record, with vases.]

3. CARTLIDGE, CHARLES, & Co., *Green Point, New York.*—Manufacturers.
Porcelain tea, table, and fancy ware; door trimmings and sign letters.

4. HERMANN, LOUIS E., *Hoboken, New Jersey.*—Manufacturer.
China, porcelain, and earthenware, painted and gilded; exhibiting decoration and lettering.

5. STOUVENEL, JOSEPH, & BROTHER, *New York City.*—Manufacturers.
Decorated porcelain; dinner, dessert, and other services.

6. BOCH, WILLIAM, & BROTHER, *Green Point, New York.*—Manufacturers.
Stair rods, and plates of decorated porcelain; plain and gilded porcelain trimmings for doors, shutters, drawers, &c.

GREAT BRITAIN AND IRELAND.

7. HERBERT, MINTON & Co., *Stoke-upon-Trent, Staffordshire.*—Manufacturers.
Porcelain dinner, tea, and dessert service, similar to one made for Queen Victoria; statuettes, groups, and various articles in Parian clay; tiles. [For figures of vases, statuettes in Parian, &c., see pages 128, 139, 140, 141, of the Record.]

[The great variety and beauty of the objects in statuary porcelain is one of the remarkable features of this class; the great delicacy and sharpness of outline manifest great skill in overcoming the difficulties arising from the shrinking of the material when burnt. These objects are produced by "casting;" the clay, in a semifluid state, is poured into the mould, which is made of plaster of Paris; the shrinking caused by this absorbent substance will reduce a figure of two feet an inch and a half in the height. When dry, it is put into the oven; the pieces put together by the figure maker from the different moulds must be dry, and during this process another inch and a half is lost in height: during the firing, which is the severest trial, it loses three inches more, being only three-fourths of the original height. If the heat is too great the mass would be melted; if too little, the surface would be imperfect, so that the art requires great practical experience.]

8. ROSE, JOHN, & Co., *Coalbrook Dale, Shropshire.*—Manufacturers.
Porcelain embossed dinner and dessert services; epergnes, vases, &c.; groups in Parian and porcelain articles. [For figures of vases, bracket, tea service, and Queen's vase, see pages 94, 95, and 130 of the Record.]

9. RIDGEWAY, JOHN, & Co., *Cauldon Place, Newcastle-upon-Tyne.*—Manufacturers.
English porcelain table, tea, and coffee services; lawn and greenhouse fountains, drab stone pottery; hollow bricks, &c. [For elegant tea service and porcelain fountain, see pages 20 and 22 of the Record.]

10. MAYER, T. J., & J., *Longport, Staffordshire.*—Manufacturers.
Table ware, toilet and dessert ware; garden and rustic seats; slabs for fire-places; Parian vases and jugs, &c. [For Parian vases and jugs, see page 52 of the Record.]

[The greatest amount of porcelain and ceramic articles in Great Britain, is made in the district known as the "Staffordshire Potteries;" there are also extensive works at Stoke-upon-Trent. It is generally believed that potteries have existed in Staffordshire ever since their first establishment there by the Romans, though till within 150 years the objects manufactured were of the commonest and coarsest description. The potteries commence at a village called Golden Hill, and extend for a distance of more than seven miles. The "china-clay" is the decomposed feldspar of the granite, and is prepared in Cornwall and other places, before it is sent to the potteries; this, with silica, is the principal ingredient; both clay and flint are among the most widely distributed of the materials of the globe.]

11. WATKINS, WILLIAM & THOMAS, *Bradford.*—Manufacturers.
Ironstone porcelain articles for spinners and weavers.

12. COPELAND, W. T., *London.*—Manufacturer.
Works in porcelain; statuary after Foley and others; with a large collection of vases, tazzas, plateaus, trays, tableware, &c. [For figures see pages 14, 15, 16, 17, 19, 78, 79, and 98 of the Record.]

13. SAMPSON, BAIDGWOOD, & SON, *Longton, Staffordshire.*—Manufacturers.
Breakfast and tea sets in fine china, plain and ornamental. [For porcelain tea service see page 22 of the Record.]

14. Lindsley, Powell & Co., *Hanley Potteries, Staffordshire.*—Manufacturers.
Painted biscuit ware; white and painted granite ware, &c. [For pitchers and statuettes in Parian, see pages 78 and 180 of the Record.]

15. Finch, John, *City Road Basin, London.*—Manufacturer.
Porcelain bath and wash tubs; porcelain tile bath; glazed bricks and slabs.

16. Adams, W., & Sons, *Stoke-upon-Trent, Staffordshire.*—Manufactura.
Earthenware; china ware; Parian figures.

17. Ferguson, Miller & Co., *Hatfield, near Glasgow.*—Manufacturers.
Terra-cotta vases, stoneware pots, pipes, &c.
[Terra-cotta (*terre cuite* of the French) means literally clay hardened by heat; its use has been restricted in the arts to the finer clays, in which many beautiful specimens of figures and ornaments have been executed; many of these are figured in the Record.]

18. King & Co., *Stourbridge, Worcestershire.*—Manufacturers.
Bricks; patent gas ovens; glass-house pot-clay, made from Stourbridge fire-clay.

19. Grankirk Coal Company, (Mare & Thomas Sprot,) *near Glasgow.*—Manufacturers.
Busts, vases, pedestals, retorts, fancy chimney-tops, &c., made of fire-clay.

20. Cliff, Joseph, *Wortley, near Leeds, Yorkshire.*—Manufacturer.
Fire-clay retort; drain tubes; fire bricks.

21. Potter, Addison, *Wellington Quay, near Newcastle-upon-Tyne.*—Manufacturer.
Gas retorts, and vase in fire-clay.

22. Hammill, Peter, *Liverpool.*—Manufacturer.
Vitrified stone ware.

23. Hammill, John Baptiste, *Bridgewater, near London.*—Manufacturer.
Patent water and drain pipes; ridge and coping tiles; flooring and drain bricks, and roofing tiles.

24. Doulton & Watts, *Lambeth and Liverpool Potteries.*—Manufacturers.
Large stone vase; patent water filters; terra-cotta vases, &c. [For vase, vine basket, and water-cooler, see page 20 of the Record.]

25. Boote, T. & R., *Burslem, Staffordshire.*—Manufacturers.
Vases, groups of flowers, statuettes, and busts in Parian and porcelain; Doric mosaic vases, &c. [For statuettes, pitchers, &c., see pages 52 and 95 of the Record.]

26. Dimmock, Thomas, Jr., *Shelton, England.*—Manufacturer.
Porcelain plates, dishes, pitchers, basins, bowls, &c., in various styles of painting and gilding.

27. Williams, W. M., *Surrey, England.*—Manufacturer.
Busts, statuettes, and tablets in biscuit ware.

28. Pratt, F. & R., & Co., *Fenton, England.*—Manufacturers.
Fruit dishes, plates, and other articles.

BRITISH COLONIES.—CANADA.

29. McLaren, *Yamaska Pottery, Canada East.*—Manufacturer.
Green glazed vase; ornamented modern bricks, and roofing tiles.

30. Bell, Messrs., *Quebec, Canada East.*—Manufacturers.
Specimens of white, red, figured, and glazed vases; jugs, flower-pots, water-bottles, dishes, bowls, tea services, and water-pipes.

FRANCE.

31. Imperial Manufacturing Company, *Sevres.*
Collection of vases, dinner and tea services, cups and dishes, in ornamented porcelain.

32. Haviland, Brothers, & Co., *Limoges, Haute Vienne.*—Manufacturers.
Various articles in painted and ornamental porcelain. [For vases, candelabra, wine coolers, and covered dishes, see pages 110, 111, and 129 of the Record.]

33. Gosse, *Paris.*—Manufacturer.
Specimens of porcelain articles, as dishes, plates, retorts, mortars, coffee-filterers, coffee-pots, casseroles, capsules of all sizes, etc.

34. Rees, Ch. A., *Limoges, Haute Vienne.*—Manufacturer.
An extensive collection of articles in fine porcelain, highly ornamented.

35. Pettiouyt, L. A. C., & Co., *Paris.*—Manufacturers.
A variety of articles in fine and ornamental porcelain.

36. Bapterosses, *Briare, Loiret.*—Manufacturer.
Samples of plain and fancy ceramic buttons, in various colors, and gilded.

37. Bino, Brothers, & Co., *Paris.*—Manufacturers.
Two richly ornamented porcelain vases, and an assortment of rich porcelain ware.

38. Lahoche, P. J., *Paris.*—Manufacturer.
Dinner, tea, coffee, and dessert services, in decorated porcelain.

39. Hache, A., & Pepin Lehalleur, *Vierzar and Paris.*—Manufacturers.
Very fine and large collection of painted porcelain.

40. Graillon, Pierre Adrien, *Dieppe, Seine Inferieure.*—Manufacturer.
Exquisite groups, in terra cotta, of French peasants. [For figures, see pages 96 and 97 of the Record.]

THE GERMAN STATES.

41. Rothenbach, W., & Co., *Breslau, Prussian Silesia.*—Manufacturers.
Painted china ware.

42. Breitschneider, W., & Co., *Altenburg, Saxe-Altenburg.*—Manufacturers.
Various fine paintings on porcelain, in frames; porcelain toilet boxes, and painted porcelain buttons.

43. Hasak, F., *Richenstein, Prussian Silesia.*—Manufacturer.
Pipe-bowls of porcelain.

44. Arnoldi, C. E. & F., *Elgersberg, Saxe-Gotha.*—Manufacturers.
Various pharmaceutical utensils and apparatus, and water-pipes, made of clay, found in Thuringia Forest.

45. Saeltzer, Edward, *Eisenach, Saxe-Weimar.*—Manufacturer.
Terra-cotta vases, flower pots, and other ceramic articles. [For hanging baskets, brackets, and flower pots, see pages 77 and 130 of the Record.]

46. Breitschneider, A., *Altenburg, Saxe-Altenburg.*—Manufacturer.
Various paintings on porcelain.

47. Bohmlander, C. P., *Nuremberg, Bavaria.*—Manufacturer.
Various pictures on porcelain; statuettes, vases, and other articles, in decorated porcelain.

48. Baur, Brothers, *Biberach, Würtemberg.*—Manufacturers.
Fancy figures in earthenware.

49. Fasolb, Ens, & Greiner, *Lauschau, Thuringia.*—Manufacturers.
Porcelain paiatings and various articles in decorated porcelain.

50. Bucker, H., *Dresden.*—Manufacturer.
Paintings on porcelain.

51. Royal Porcelain Manufactory, *Berlin.*—Manufacturer.
Gilded and richly decorated porcelain vases and table services. [For vases and tea services, see page 123 of the Record.]

[The first European manufactory of porcelain was established at Meissen, under the auspices of Augustus II., Elector of Saxony and King of Poland. Böttcher, who originated the establishment, made his first ware from a red earth found there; he did not make white porcelain till 1709, when he used the China clay of Arve. From that time the Saxon porcelain has been highly esteemed, and the manufactory has been continually under the direction and patronage of the government. The Dresden china has become famous throughout Europe.

When Frederick the Great conquered Saxony, he carried away by force several of the best workmen from the Meissen manufactory, near Dresden, and conveyed them to Berlin, where since that time the royal manufactory has been in successful operation. Several hundred men are constantly employed in the establishment; but the Prussian porcelain has never equalled in quality that of Dresden.]

52. Mullenbach & Thewald, *Hohr.*—Manufacturers.
Specimens of earthenware; pipe bowls.

53. WIMMER, HENRY, *Munich.*—Manufacturer.
Paintings on china.

54. MEYER, BROTHERS, *Munich.*—Manufacturers.
Painted porcelain pipe-bowls.

THE AUSTRIAN EMPIRE.

55. BAHR & MARESCH, *Aussig-on-the-Elbe, Bohemia.*—Manufacturers.
Vases, urns, flower and fruit baskets, candlesticks, pier-tables, jugs, tobacco-boxes, and various other articles of ware called "Syderolite ware."

56. SCHEIFFELIN, S., *New York City.*—Importer.
Assortment of Bohemian porcelain.

57. FISCHER, M., *Herend, Hungary.*—Manufacturer.
Dinner, tea, and coffee services; candlesticks, vases, &c., of fine porcelain.

58. KUGLER, JOHN W., *Güns.*—Manufacturer.
Various ceramic articles; terra-cottas, figures, &c.

59. BONI, ANDREA, *Milan.*—Manufacturer.
Chimney-pieces and vases in terra-cotta. [For female statue, terra-cotta vases, and figures, and chimney-piece, see pages 50, 52, 91, 95, of the "Record."]

THE ITALIAN STATES.

60. GINORI-LISCÉ, MARQUIS, *Florence, Tuscany.*—Manufacturer.
Chemical utensils, telegraph insulators, hooks for silk-spinning, and other articles of earthen-ware. Transparent pictures in porcelain. Picture of Virgin and child, with style of Luca della Robbia.

SWITZERLAND.

61. ZIEGLER, PELLIS J., *Winterthur, Canton St. Gall.*—Manufacturer.
Figures, groups, statuettes, vases, lamps, medallions, and other objects in terra cotta. (The medallions are exhibited for the delicacy of their impressions.)

BELGIUM.

62. CAPELLMANS, T. B., SEN., DEBY & Co., *St. Vaast, Hainault.*—Manufacturers.
An assortment of common table crockery and porcelain.

SECTION III. CLASS XXVI.

ARTICLES OF HOUSEHOLD FURNITURE AND DECORATION.

THIS Class of manufactures is largely represented; and in all its varieties specimens are exhibited remarkable alike for richness of material, thorough workmanship, and elaborate finish. It is to be regretted that similar praise cannot be bestowed upon the taste displayed in a large majority of the articles, or upon their fitness for the purposes to which they were designed. The whole history and theory of household furniture and decoration is, however, set forth in such detail in the essay upon that subject in the ILLUSTRATED RECORD, page 182, as to make further remark upon the subject in this place mere repetition.

The contributions to this Department of the Exhibition are chiefly from the United States; and in the United States, New York sends by far the greater number of the articles. Distance has doubtless something to do with this preponderance, but there is as little doubt that it is in a great measure due to that recklessness of expenditure in the furnishing of private houses in New York, which has almost passed into a proverb.

Nearly all the artisans engaged in the manufacture of articles of decorative household furniture in the United States are foreigners, Germans and Frenchmen being in the majority.

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1. SMITH, JOHN, *New York City.*—Manufacturer.

The palace secretary, a piece of ornamental furniture, made of rose-wood and marble. It combines a bedstead, writing-desk, book-case, wash-stand, gentleman's wardrobe, medicine-drawers, secret silver closet, dressing-bureau, ladies' wardrobe, and secret jewelry case; the whole surmounted by a musical and alarm clock.

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2. DESSOIR, JULES, *New York City.*—Manufacturer.

A library book-case, in rose-wood; octagon and console-table; sofa, chairs, and library tables. [For figures see Record, pages 173 and 175.]

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3. SIMMONS, ALPHEUS, *New York City.*—Manufacturer.

Mosaic inlaid round table.

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4. HOBE, CHARLES F., & SON, *New York City.*—Manufacturers.

Hobe's patent extension-table and sideboard, in carved oak. [For figure see Record, page 125.]

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5. ROUX, ALEXANDER, *New York City.*—Manufacturer.

Sideboard, extension-table, and arm-chair, of richly carved black walnut; rose-wood sofa and arm-chair, covered with brocade. [For figure of sideboard see Record, page 162.]

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6. BLAKE, JAMES G., *Boston, Massachusetts.*—Proprietor.

Carved rose-wood sideboard; chair for library, the back of which turns over to form a pair of steps; smoking-chair; siamese-chair; changeable lounge; pier-table; model of a circular stair-case, made by A. ELLAERS of Boston. [For figures of the sideboard and pier-table see the Record, pages 114 and 164.]

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7. HYDE, J. L., *New York City.*—Manufacturer.

Dressing-tables, bronze and gilded work, finished in papier-maché; Chinnock's patent pantreptic mirrors and clocks.

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8. BROOKS, T., *New York City.*—Manufacturer.

Richly carved rose-wood etagères, designed by Herter. [For figures see the Record, pages 16 and 93.]

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9. BULKLEY & HERTER, *New York City.*—Manufacturers.

A Gothic book-case, richly carved in oak, of the natural color, containing elegantly bound and printed books, published by George P. Putnam & Co. [Figured on page 67 of the Record.] A richly carved oak buffet of the natural color; a central group, representing the death of the stag; with ornaments of game and fruits, and geometrical designs. [For figures see pages 168 and 169 of the Record.]

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10. BUCHENBERGER, ANTHONY N., *Brooklyn, New York.*—Manufacturer.

Ladies' toilet-table, in the shape of a sixteen-cornered urn.

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11. MATTHEWS & STACY, *New York City.*—Manufacturers.

Rich and ornamental chamber furniture, in white and gold enamel.

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12. HUTCHINGS, E. W., *New York City.*—Manufacturer.

Sideboard, sofa, arm-chair, tête-à-tête sofa, etagère mirror and chair, exhibited in space decorated by Thomas, Brothers.

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13. CAMPBELL, IRA, *New York City.*—Manufacturer.

Gothic sideboard, in oak; self-adjusting.

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14. KING, MATTHEW W., & SON, *New York City.*—Manufacturers.

Wheel-chair for invalids; extension recumbent chair; parlor and revolving chairs, in figured satin. [For figure see Record, page 142.]

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15. RINGUET, LE PRINCE & MARCOTTE, *New York City.*—Manufacturers.

Specimen of richly carved and ornamental cabinet work in wood. A black walnut buffet, richly ornamented with paintings; an ebony cabinet, with inlaid panels and brass-gilt ornaments. [For figures see pages 47 and 52 of the Record.]

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16. HUGHES, CORNELIUS, *Newark, New Jersey.*—Manufacturer.

O'Neil's patent combined parlor arm-chair, and invalid couch.

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17. SUDSBERG, JOSEPH M., *New York City.*—Manufacturer.

A carved arm-chair.

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18. EVANS & MILLWARD, *New York City.*—Manufacturers.

Papier-maché book-case, work-table, desk, chairs, music-stand, and other furniture.

[There are two modes of manufacturing papier-maché; one consists in pasting together on a mould different thicknesses of paper, the other is by pressing in moulds the paper reduced to a pulp; the former produces the best quality, the latter the inferior kinds. In the first mode sheets of strong paper are glued together, and pressed so powerfully as to become one sheet; when damp it may be readily curved; when dry it may be turned or rasped into any desired figure. After being covered with a mixture of size and lamp-black, a varnish, made of turpentine, amber, and lamp-black, is applied, and the article is placed in a heated oven. Papier-maché, properly so called, is pressed into moulds in the state of pulp; this is made of the cuttings of coarse paper, boiled in water, beaten to a paste, and boiled in a solution of gum-arabic, to give it consistency. The moulds are made in the usual way, with counter-moulds, so that the cast is only a crust or shell. The coarser kinds of ornaments are sometimes made from the pulp of the paper-maker pressed in this manner into moulds. After varnishing, the irregularities of the surface are removed by pumice-stone; it is then again varnished, polished with rotten-stone, and the final brilliancy given by rubbing with the hand.]

19. Neppert, J. P., *New York City.*—Manufacturer.
Two piano-forte stools.

20. Simpson, William, *New York City.*—Manufacturer.
Tête-à-tête sofa and chairs, in rosewood, covered with crimson-satin brocatelle.

21. Gschwind, John, *New York City.*—Manufacturer.
A set of ornamented and gilt chamber furniture, with spring drawers.

22. Rochefort & Skarren, *New York City.*—Manufacturers.
A carved oaken buffet, in the "Renaissance" style, ornamented with figures of game and fish, fruit and flowers, finished in the natural color. A rose-wood panel, carved with figures of roses. [For figures see pages 111 and 114 of the Record.]

23. Pells & Lowaski, *New York City.*—Manufacturers.
Arm-chair in the Turkish style, with spring steel back, and richly decorated.

24. Weston, Oscar, *New York City.*—Manufacturer.
An oak-wood etagère.

25. Franklin & Beyrodt, *Poughkeepsie, New York.*—Manufacturers.
Easy-chair, with movable back and concealed mechanism.

26. Michel, Miss E. L., *New Orleans, Louisiana.*—Manufacturer.
An arm-chair, with embroidered back and cushion.

27. Hart, Ware & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Cottage enameled and richly ornamented bedstead.

28. Lutz, Ignatius, *Philadelphia, Pennsylvania.*—Manufacturer.
Parlor-chairs in black walnut.

29. Scarrett, Russell, *St. Louis, Missouri.*—Manufacturer.
Cottage sofa-bedstead; model of a new sofa-bed.

30. Hills, Anna M., *St. Louis, Missouri.*—Manufacturer.
Cushioned chair, wrought by the exhibitor.

31. Eastman, John H., *Philadelphia, Pennsylvania.*—Manufacturer.
Bedstead, with movable bottom and frame-work at top, and spring mattresses.

32. Shattuck, William G., *Boston, Massachusetts.*—Manufacturer.
Desks and chairs for school-rooms.

33. Leonard & Benjamin, *New York City.*—Manufacturers.
A richly carved rosewood billiard table, with improved cushions.

34. Bassford, Abraham, *New York City.*—Patentee and Manufacturer.
Rosewood billiard table, elaborately carved in the Elizabethan style, with patent cushions.

35. Winant, D. D., *New York City.*—Manufacturer.
A rosewood billiard table, and appliances.

36. Ward, Warren, *New York City.*—Manufacturer.
A set of enameled chamber furniture, inlaid with pearl and gold, with marble tops, consisting of eleven pieces.

[This kind of cabinet-work is called "marquetry," the surface of the wood being ornamented with inlaid pieces of gold, silver, pearl, tortoise-shell, ivory, horn, or rare woods. These substances are reduced to the proper thinness, and cut into the desired patterns by punches, which, while they cut out the pattern, allow the space which inclosed it to be made use of in this kind of ornament; they are retained in the places cut to receive them by a proper cement, or are attached to the plane surface, and the whole brought up to their level by thicknesses of varnish, which give an inlaid appearance.]

37. Walker, D., & Co., *Newark, New Jersey.*—Manufacturers.
Spring-rocking cradle in carved wood.

38. Gillies, T. S., *New York City.*—Manufacturer.
Centripetal spring-chairs, hat-stands, piano-stools; iron bedsteads.

39. Cragin, George, *Brooklyn, New York.*—Agent.
Ornamental rustic seats and stands.

40. Earl & Reeves, *New York City.*—Manufacturers.
Counter show-case, in silver and plate glass.

41. Campbell, Andrew J., *New York City.*—Manufacturer.
Oriental octagonal show-case, of silver, satin-wood, and rosewood.

42. Flynn, Daniel, *New York City.*—Inventor and Manufacturer.
Self-gravitating and pendulating portable berth-bed.

43. Demeure, Mauritz & Co., *New York City.*—Manufacturers.
A French elastic spring bed-bottom, resting on galvanized iron spirals; and an iron bedstead.

44. Willard, Samuel, *Troy, New York.*—Manufacturer.
Portable tent-frame and mosquito-bar.

45. Latilla, Eugenio, *New York City.*—Manufacturer.
Richly ornamented pilaster panel, painted in encaustic or wax.

46. Fields, William W., *New York City.*—Manufacturer.
Panels painted in imitation of rosewood, black walnut, and mahogany.

47. Kimball & Staples, *South Bend, Indiana.*—Manufacturers.
Specimens of black walnut, maple, oak, and other American veneer woods, on panels.

48. Du Bois, J. G., *New York City.*—Manufacturer.
Parlor door, with elliptic head, exhibiting a variety of mouldings.

49. Lane, H. & F. M., *New York City.*—Manufacturers.
Ornamental door; richly gilt and painted signs.

50. Payne, John, *New York City.*—Manufacturer.
Decorated panels, painted in imitation of woods and marbles.

51. Garthwaite, Robert, *New York City.*—Manufacturer.
Painted imitations of woods and marbles, on panels.

51A. Barnard, Andrew B., *New York City.*—Manufacturer.
Samples of doors made of chestnut-wood.

[This wood is stronger and more durable than pine, has a very handsome natural color and grain, and needs only varnishing to give it a very bright appearance. These doors can be furnished at about the cost of those made from pine, and, in fact, for a less cost, as they do not need painting. They are manufactured in Franklin county, Massachusetts, and employ about fourteen persons.]

51B. Butler, James L., *New York City.*—Agent.
Specimens of scale-boards, or thin veneering in white-wood, of thicknesses varying from six to thirty-two to an inch.

52. De Zurche, J. B., *Troy, New York.*—Manufacturer.
Specimens of carved wood-work.

53. Thomas, Brothers, *New York City.*—Manufacturers.
Wall decorations in cartoons.

54. Conn & Dumke, *New York City.*—Manufacturers.
Gilt frames and mouldings.

55. Black & Gramm, *New York City.*—Manufacturers.
Specimens of richly gilt mouldings and patterns of mouldings.

56. Marcher, James, *New York City.*—Manufacturer.
Specimens of gilt and prepared mouldings.

[This kind of gilding is performed by gold leaf; the frames are previously prepared by a size, made by boiling parchment-clippings to a stiff jelly, and mixed with fine Paris-plaster or yellow-ochre. In gilding on wood, the pattern to be gilt is exactly washed with gold-size (linseed oil and gum animi, thinned with oil of turpentine), and the gold leaves, cut by the pallet-knife, are transferred by the tip-brush to the sized surface, tapped with a silk bag filled with cotton, and left to dry. Gilding in cornices, &c., is effected by priming with boiled linseed-oil and carbonate of lead; the surface is then covered with gold-size, and the leaf applied; the edges are then brushed off.]

57. McNamee, Richard, *New York City.*—Agent for Union Paper Hanging Manufacturing Company.
A variety of paper hangings.

58. Phillips, Alfred R., *New York City.*—Manufacturer.
Specimens of style for hanging wall papers.

59. Perkins, Smith & Co., *New Bedford, Massachusetts.*—Manufacturers.
Specimens of wall and decorative papers.

60. Eames, Cook & Beaven, *Brooklyn, New York.*—Manufacturers.
Specimens of wall papers and fancy borders.

61. Croton Manufacturing Company.—Manufacturers. (Agent, Thomas N. Partridge, *New York City.*)
Plain and richly decorated wall and curtain papers; fire-board prints; transparent window-shades.

62. Graves, Robert, *Brooklyn, New York.*—Manufacturer.
Imitation oak and marble papers for decorative purposes.

63. Hart, Montgomery & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Specimens of rich decorative papers, borders, and fire-board prints.

64. Bigelow, J. R., & Co., *Boston, Massachusetts.*—Manufacturers.
A variety of wall papers and borders.

65. Golder, A., & Son, *Baltimore, Maryland.*—Manufacturers.
Specimens of ornamental paper hangings.

[Paper hangings came into use about two hundred years ago, and seem to have been copied from the Chinese. The patterns were at first produced by stencil plates, but they are now produced by blocks, as in calico-printing; the patterns are sometimes printed in varnish or size, and gilt, or silver or copper leaf applied, or bisulphuret of tin is dusted over so as to adhere to the pattern; in what are called *flock*, or *velvet* papers, dyed wools, minced into powder, are similarly applied. Powdered steatite is used to produce the peculiar *satin* gloss. The ground color of paper is done with earthy colors, or colored lakes thickened with size, and applied with brushes; after being dried, the paper is polished either with a brass polisher or a strong brush, if the satiny luster is to be produced. The colors are laid on by block-press printing or by the cylinder machine; with the latter, 18,000 yards a day may be printed; the pieces are afterwards cut into rolls of twelve yards each.]

66. Shaw, R. T., *New York City.*—Manufacturer.
A variety of window-shades.

67. Woodford, Josiah C., & Co., *New York City.*—Manufacturers.
A variety of window-shades.

68. Kelty & Ferguson, *New York City.*—Manufacturers.
Window-shades and transparencies.

69. Schveder, E. J., & Co., *New York City.*—Manufacturers.
Transparent window-shades; specimens of decorative panels.

70. Deuscher, Louis, *New York City.*—Manufacturer.
Window-shades, with new style of ornament.

71. Grosheim, C. F., *New York City.*—Agent for Manufacturer.
Transparent window-shades.

72. Bray, Benjamin, *Salem, Massachusetts.*—Designer and Manufacturer.
"Patent balance-spring" transparent window-shades.

73. Solomon & Hart, *New York City.*—Designers and Manufacturers.
French paper hangings; velvet curtains; cornices, and rich upholstery goods.

74. Newland, E., & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
A richly gilt pier-glass, surmounted by a figure of "Kiss's Amazon;" a richly gilt mantel-glass.

75. Kingsland, Richard, & Co., *New York City.*—Manufacturers.
Ornamental mirrors, arranged for decorative effect.

76. Walter & Kreps, *New York City.*—Manufacturers.
An ornamental mirror.

[The old way of silvering looking-glasses and mirrors, was by an extemporaneous amalgamation of tin and mercury. Tin-foil was placed on the back of the glass, and some mercury poured on it, and spread over the surface; another glass was then slid over the tin, and the superfluous mercury expelled by weights, leaving only a thin amalgam on the back of the glass.

A few years ago, Mr. Drayton invented a process for silvering glass as follows:—One ounce of ammonia, two ounces of nitrate of silver, three ounces of water, and three ounces of spirit-of-wine, are mixed with water, allowed to stand three or four hours, and then filtered; a quarter of an ounce of grape-sugar, dissolved in a half pint of spirit-of-wine and half a pint of water, is added to each ounce of the filtered liquid; and this solution is used for silvering, the article to be silvered being kept at 160°. These materials have been used in different proportions, mixed with oil of cloves; the cost is said to be only one-third that of amalgamated tin, as a very thin coating of silver is sufficient; the coating of metallic silver is sometimes deposited in fifteen minutes. Silvering glass has been effected by dissolving gun-cotton in caustic potash, adding a little nitrate of silver, and sufficient ammonia to redissolve the oxyd of silver, while the whole is kept warm. Other analogous nitric compounds of sugar, manna, and gums, produce a like result, the whole of the silver being precipitated as a brilliant coating.]

77. Belknap, J., Jr., *New York City.*—Manufacturer.
Brackets, of leather, in imitation of carved wood.

78. Carey, Henry C., *Burlington, New Jersey.*—Proprietor.
Picture-frames, ornamented with flowers of leather, in imitation of wood, made by H. Etheridge, of Cambridge, Massachusetts.

GREAT BRITAIN AND IRELAND.

79. Morant & Boyd, *London.*—Designers and Manufacturers.
An elaborate specimen of interior decoration, in the style of François Ier; cabinet and console table, and mirror, in burnished and mat gold; sofa-table, center-tables, screens, jardinières, and tripod stand. [For figure of the cabinet, see the Record, page 166.]

80. Rowland, Alexander William, *London.*—Manufacturer.
A lady's work-table.

81. Arrowsmith, Henry & Arthur, *Westminster.*—Designers and Manufacturers.
A decorated cabinet of zebra-wood, richly carved, and ornamented with gold and enameled panels. The paintings illustrate woman's history, and were executed by Henry Arrowsmith. 1. "The lesson;" youth and experience; in the upper compartment, "study." 2. "Cupid asleep;" the lady and her pets. 3. "Cupid awake;" the lovers. 4. "Hymen's torch burns brightly;" the lady with her husband and children; upper compartment, "peace and plenty." [For figure, see the Record, page 172.]

82. Fox, Jeremiah, *Lynn, Norfolk.*—Manufacturer.
Walnut-wood fire-screens; the stands and frames highly ornamented, and the screens of Berlin wool-work. [For figures, see the Record, pages 96 and 97.]

83. Jones, Aathur, & Co., *Dublin.*—Designers.
Iron bog-yew Devonport writing-desk, in the Renaissance style.

[Many of the bogs of Ireland were once covered with forests of firs, oaks, yews, and other trees, the timber of which is found imbedded in the turf, in a good state of preservation. The wood of the fir is still so impregnated with resin that its splinters are used as torches. The bog-oak and yew are found in sufficient quantities and size for the manufacture of furniture. The dark color of bog-oak is generally considered to be due to the combination of the iron, contained in the bog, with the gallic acid of the wood, forming a natural stain like ink.]

84. Fletcher, John, *Cork.*—Designer and Manufacturer.
The "shamrock-table," comprising thirteen varieties of rare Irish timber, viz., pollard-oak, sweet-chestnut, brown-elm, yew, ash, walnut, bog-oak, white-chestnut, root of acacia, locust, shady curl-oak, lime-tree, and a natural branch of oak.

85. Shoolbred, Loveridge & Shoolbred, *Wolverhampton.*—Manufacturers.
Specimens of papier-maché and fine japanned ware.

86. Jennens & Bettridge, *London.*—Manufacturers.
Trays, tables, chairs, screens, tea-caddies, ink-stands, &c., in papier-maché, inlaid with pearl. [For figures see pages 61 and 173 of the Record.]

[The inlaying with mother-of-pearl does not consist, as its name would imply, in cutting out the papier-maché and inserting the pearl; the latter is held only by adhesion. The pearl having been attached by a layer of copal varnish, repeated coats of tar varnish are applied to a level with the pearl, and even to cover it; a uniform surface is produced, and the pearl exposed by rubbing with pumice-stone, and polishing with rotten-stone and with the hand.

The exhibitors have a patent process, which consists in penciling the design upon the pearl in a medium which will resist acids, and then removing the superfluous portions by acids; more delicate designs can thus be obtained than with the saw, and with more facility.]

87. Sutcliffe, Isherwood, *Birmingham.*—Manufacturer.
Ornamental papier-maché tables, trays, work-boxes, cabinets, and japanned goods.

88. Spiers & Son, *Oxford.*—Designers and Manufacturers.
Decorated papier-maché table, with a view of Oxford, views of the buildings, &c.

89. Rogers, W. G., *London.*—Manufacturer.
Church reading-desk, of richly carved wood; two panels of exquisitely carved flowers; a panel with the instruments and trophies of the chase; a grotesque mask, about which three youthful fauns are wreathing flowers and fruit; a large mirror in a richly carved wood frame. [For figures see page 66 of the Record.]

90. Carew, John E., *London.*—Designer and Sculptor.
An altar-piece of carved wood.

91. Howlett, William, *London.*—Manufacturer.
Paper-hangings, and cut blocks for printing wall papers.

92. Winterbottom, Archibald, *Manchester.*—Manufacturer.
Paper-hangings, in imitation of cloth and velvet.

BRITISH COLONIES.—CANADA.

93. Irvine, Colonel, *Quebec.*—Proprietor.
A fancy table-top, of bird's-eye maple, ornamented with natural leaves, exhibiting the varied autumnal tints.

FRANCE.

94. Balny, Jr., *Paris.*—Manufacturer.
Articles of elegant drawing-room furniture; an elegant parlor chair, enameled in white and gold, and upholstered with white and red damask, in the style of Louis XIV.; a parlor-chair of French black walnut. [For figures see the Record, page 48.]

95. Paillard, J. M., *Paris.*—Manufacturer.
A table of ebony, of the style of Louis XVI., richly gilded and inlaid, and containing materials for all varieties of drawing and painting.

96. Binet, *Paris.*—Manufacturer.
Cellarets of rosewood and ebony, with bottles.

97. Guyot, *Paris.*—Manufacturer.
Furnished wine-cellarets.

98. Feron, J. F., *Paris.*—Manufacturer.
Specimens of ornamental stair-balusters in wood.

99. Zuber & Co., *Rixheim, Haut Rhin.*—Manufacturers.
Specimens of paper-hangings, of various descriptions.

100. Burgh, Sen., Roedel & Co., *Paris.*—Manufacturers.
Pattern-cards of velvet papers, with specimens of paste, colors, and dyed wools used in their manufacture.

101. Delicourt & Co., *Paris.*—Manufacturers.
Panels of richly stained papers, and rolls of painted and ornamental paper-hangings.

102. Desfosse, Jules, *Paris.*—Manufacturer.
A grand tableau of decorative wall-papers.

103. Durut, A., *Paris.*—Manufacturer.
Four ornamental chimney-screens.

104. Aubenel, J., *Paris.*—Manufacturer.
Ornamental door of gilded iron and plate-glass.

105. Morgant, E., *Guines, Pas de Calais.*—Manufacturer.
Two transparent water-proof window-shades, painted with historical subjects.

THE GERMAN STATES.

106. Hilger, Carl, *Dusseldorf, Rhenish Prussia.*—Manufacturer.
A ladies' writing-desk and work-table in ebony, inlaid with four water-color views of the Rhine, and ornamented with cornelian and agate. [For a note on the woods used in cabinet-work, see page of the Catalogue.]

107. Forquinquor, Joseph, *Bremen.*—Manufacturer.
Various articles of furniture.

108. Wischmann, *Bremen.*—Manufacturer.
A bureau.

109. Uhlhorn, *Bremen.*—Manufacturer.
A variety of chairs.

110. Riegelmann, *Bremen.*—Manufacturer.
Rosewood book-case.

111. Klein, Julius, *Berlin.*—Manufacturer.
Work-boxes; gilt mouldings, and beadings of various kinds.

112. Buerck, F. W., *Mannheine, Baden.*—Manufacturer.
Rosewood work-boxes, and articles in fancy woods.

113. Langrebe, *Berlin.*—Manufacturer.
A signboard ornamented in gold letters.

114. Mess, L., & Co., *Brandenburg, Prussia.*—Manufacturers.
Samples of fine gilt mouldings.

115. Mueller, S. G. H., *Leipsic, Saxony.*—Manufacturer.
An inlaid rosewood table-top.

116. Heinz, Gotthold, *Johami-Georgenstadt, Saxony.*—Manufacturer.
Toilet-tables and work-boxes, inlaid with mother-of-pearl.

117. Schmidt, J. B., *Nuremberg, Bavaria.*—Manufacturer.
Gilt mouldings and beadings.

118. Boege, A., *Berlin.*—Manufacturer.
Gold beadings for frames and cornices.

119. Kircher, F. A., *Halle, Prussian Saxony.*—Manufacturer.
A variety of gilt mouldings.

120. Lamfried, G. A., *Berlin.*—Manufacturer.
A variety of gilt mouldings.

121. Berlin & Ehrmann, *Fürth, Bavaria.*—Manufacturers.
A variety of mirrors.

122. Bache, J., *Fürth, Bavaria.*—Manufacturer.
A parlor mirror.

123. Huetter & Osterhausen, *Nuremberg.*—Manufacturers.
Gilded frames.

124. Fischer, J. Z., & Son, *Fürth, Bavaria.*—Manufacturers.
Two mirrors.

125. Fendler, G. C., *Nuremberg.*—Manufacturer.
Mirrors.

126. Scherber, I., *Nuremberg.*—Manufacturer.
Mirrors.

127. Rau & Co., *Goeppingen, Wurtemberg.*—Inventors and Manufacturers.
Various articles of papier-maché inlaid with pearl.

128. Meyer & Wried, *Brunswick.*—Manufacturers.
Japanned tea-trays, with pictures after Nickoll and others.

129. Burckhardt & Son, *Berlin.*—Manufacturers.
Painted window-shades.

130. Halls, Simon, & Son, *Cassel, Hesse Cassel.*—Manufacturers.
Painted window-shades.

131. Vogelin & Co., *Constance.*—Manufacturers.
Specimens of wall papers.

132. Brackebush & Herting, *Eimbeck, Hanover.*—Manufacturers.
Various patterns of paper hangings and borders.

THE AUSTRIAN EMPIRE.

133. Thonet, Brothers, *Vienna.*—Manufacturers.
Various articles of bent wood furniture.

[The flexibility of woods is greatly increased by steaming or boiling; when thus softened, many elastic woods may be made to assume various fancy forms, in contact with rigid moulds; if allowed to grow cold, thus fixed, they will, for the most part retain the form given to them. As the fibers are parallel with the curve, much greater strength is secured to articles thus made than in any other way of producing curved forms.]

134. Standinger, Anton, *Vienna.*—Manufacturer.
Buhl table of rosewood, and other furniture.

THE ITALIAN STATES.

135. Falcini, Brothers, *Florence, Tuscany.*—Manufacturers.
Table and chair of ebony, in antique style, inlaid with variously colored woods.

136. Zora, G., *Turin, Sardinia.*—Manufacturer.
An arm-chair in Greek style, richly gilt and ornamented. [For figure, see page 96 of the Record.]

137. Canepa, G. B., *Chiavari, Sardinia.*—Manufacturer.
Cabinet escritoire of mahogany; chairs of gothic patterns, in white and colored woods.

138. Cuoliererо, Raimondo, *Settimo, near Turin.*—Manufacturer.
Two richly painted chairs.

139. Martinotti, G., *Turin.*—Manufacturer.
An inlaid toilet-table of rosewood.

140. Campanino, Guiseppe Descalzi & Son, *Genoa.*—Manufacturers.
Table of imitation turtle-shell work; center-table in the ray style; Chiavari chairs in various woods and colors.

141. Mangini, A., *Genoa.*—Manufacturer.
Mahogany bedstead in Greek style, richly inlaid in gold and bronze; bureaus, consoles, and other chamber furniture, in mahogany and variegated marbles.

142. Novaro, L., *Genoa.*—Manufacturer.
Common and gothic chairs, richly gilded and ornamented.

143. Franceschini, Francesco, *Pisa, Tuscany.*—Manufacturer.
A rustic arm-chair and stool, lined and seated with moss.

144. Da Fieno, G., *Genoa.*—Manufacturer.
Two frames for console and mantel mirrors, richly carved in the Raffaelesque style; a console-table. [For figure, see page 125 of the Record.]

145. Savio & Sola, *Alessandria, Sardinia.*—Manufacturers.
Iron-like frame of wood, for pictures, &c.

146. Zampini, Luigi, *Florence.*—Manufacturer.
Two round table-tops, in imitation of Chinese work; and two japanned and painted trunks.

147. Ciando, G., *Nice, Sardinia.*—Manufacturer.
Center-tables in various ornamental woods, in their natural colors, with sculptured stands, and inlaid mosaic tops, richly painted.

148. Bosi, Enrico, *Florence.*—Manufacturer.
An antique ebony cabinet, with the arms of the Medici, ornamented with panels of Florentine mosaics.

SWITZERLAND.

149. Ebersold, Gabriel, *Berne.*—Manufacturer.
A work-table, and convenient furniture for an invalid.

150. Wirtz, J., *Berne.*—Manufacturer.
Table, bureau, &c., of painted wood. The material is of a light color, excessively ornamented with carvings. [For figure of the table, see the Record, page 158.]

THE NETHERLANDS.

151. Gamelkoorn, R. J., *Arnhem.*—Manufacturer.
A richly carved ebony cabinet; the ornaments representing hunting-scenes. [Figured on page 62 of the Record.] An easy-chair.

152. Koster, E., *Utrecht.*—Manufacturer.
Two ebony fancy chairs.

153. Meurino, J. L. & H., *Amsterdam.*—Manufacturers.
A table which may be folded in four forms, as a pier-table, chess-table, card-table, and lady's writing-table.

154. Horrix, Brothers, *The Hague.*—Manufacturers.
Circular sofa, with six divisions.

155. Vogelpoel, P., *Haarlem.*—Manufacturer.
Two dressing-cases, and two locket-tables.

156. Seim, D., *Amsterdam.*—Manufacturer.
Pendent-table, with marble top.

157. Vandenberg, J., *Leyden.*—Manufacturer.
Richly gilt and velveted papers for walls.

158. Zeegers, F., *Amsterdam.*—Manufacturer.
Folding-screen, richly japanned in Chinese style; wooden table in red lacquer; fancy lacquered stands, and other articles.

159. Franze, W. A., *Haarlem.*—Manufacturer.
Ladies' work-tables, card-tables, tea-table, toilet and other stands, in japanned work.

SECTION III. CLASS XXVII.

MINERAL MANUFACTURES USED FOR BUILDING OR DECORATION.

The subjects defined by the general term of Mineral Manufactures, include a great variety of articles manufactured in marble, slate, porphyries, cements, artificial stones, and clay. In studying them systematically, it will be found convenient to arrange them into two principal groups. The first group will include all carved, sculptured and polished work in a solid material; and the second, all moulded and modeled work in clay, cement, and artificial stone. There is an essential difference between these two divisions in the style and methods of work, and they are rarely undertaken by the same artist. Except the massive building-stones, which occur as rocks, and are included among the raw materials of Class I., the whole number of non-metallic mineral substances employed for construction and decoration are found in the present class. It is therefore an extensive and interesting section of the Exhibition. It may be useful to direct attention to some of the more prominent objects.

In the Department of the United States, several chimney-pieces are exhibited. These are creditable for the care and skill shown in the elaborate carving, which, however, from its high relief, undercutting, and the character of its design, renders the mantels singularly unfit for use. Specimens of terra cotta, of good workmanship, but without novelty of design, are shown from a manufactory in Massachusetts. This is a new industry in this country. A novel, and, in all probability, a highly important invention, is shown in the method of utilizing the slags of iron furnaces. These heretofore waste and troublesome products are made into tiles, and bottles resembling in quality ordinary glass bottles, but much cheaper. In the English Department, Messrs. Minton exhibit the beautiful encaustic tiles—a branch of artistic manufacture which they re-invented. A colored plate of some of the patterns may be found in the Illustrated Record, page 51.

Specimens of the beautiful spar of Derbyshire, and the articles made from it, are also shown. Several Italian exhibitors have sent specimens of the Roman and Florentine mosaics. Many of these possess exquisite beauty, and are monuments of the artist's laborious and skillful hand. The reader is referred to the Illustrated Record for figures of some of these mosaics and a description of the art.

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1. Levy, James, *New York City.*—Manufacturer.

Two carved white marble mantel-pieces—are richly carved with fruits and flowers; a female figure in the center; wild beasts and snakes on each side. The other represents in the center a condor and two panthers fighting for a lamb which the former has seized; on the sides, a male and female Indian under the shade of a palm tree.

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2. Ferris & Taber, *New York City.*—Manufacturers.

A carved mantel-piece, in white marble, ornamented with fruits and flowers; a vase and pedestal, in marble.

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3. Gori, Ottaviano, *New York City.*—Manufacturer.

A mantel-piece of variegated marble.

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4. Morrison, John, *New York City.*—Manufacturer.

An emblematic marble mantel-piece, with a figure representing Europe on the left, America on the right, and Asia over the center.

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5. North River Mining and Quarrying Company, *New York City.*—Manufacturers.

Elaborately carved mantel-piece, table-tops, shafts, columns, slabs, etc., of American marbles.

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6. Kennedy, John, *New York City.*—Manufacturer.

A white marble mantel-piece, sculptured in the Renaissance style, with friezes of foliage, birds, salamanders, and snakes; and central shield, with female figures on the sides.

[Marble is cut with a thin plate of soft iron, used as a saw, supplied constantly with sharp sand and water, either by hand or machine-power. Polishing is effected by rubbing with sand of coarse and then finer qualities, with emery, tripoli, and finally tin-putty, or a piece of coarse cotton cloth. Marble may be turned in the lathe, the cutting tool being a well-tempered bar of fine steel. The chisel is however always used by the true artist to bring out his ornaments with distinctness and sharp outline; the file and pumice-stone render the work easier, but also tamer and more indistinct. These mantel-pieces show considerable skill in execution and design, and are highly polished; but there is a want of adaptiveness of the style of ornament to the object.]

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7. Lyeth, John McF., *Baltimore, Maryland.*—Inventor and Manufacturer.

Italian marble slab coffin.

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8. Salamander Marble Company, *New York City.*—Inventors and Manufacturers.

Marbleized iron mantels, columns, table-tops, and other articles—a purely American invention.

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9. Silexian Marble Company, *New York City.*—Manufacturers.

Silicious marble columns, mantels, pedestals, panels; table, bureau, and counter-tops; various articles of household furniture, and architectural embellishments.

[Artificial stone ordinarily has silica for its base and combining material. It is a collection of particles of sand, pebbles, limestone, marble, or indeed of almost any material, held together by a solution of silicate of soda or potash, as by a kind of glass. Flints are dissolved by heat, under strong pressure, in the caustic alkali, and the other materials are added, the paste being moulded into the required form while hot; after being air-dried, the composition is burned in a kiln at a bright red heat, during which the free alkali combines with the silica, forming a glass, in which the materials are cemented. The composition being impermeable to moisture, is proof against frost and the action of the weather, and is extremely hard. Works made from this material do not sensibly contract during the process of baking.

Sieman's patent (in Bavaria, 1845) makes silicious stone as follows: 100 pounds of caustic soda, in solution, are evaporated to 80 quarts, and one pound of silica added for every quart; the solution is effected under a pressure of about five atmospheres. This solution, mixed with quartz sand, hardens to a stone which strikes fire with steel. For building purposes, one part of the solution is mixed with two volumes of fine silica, to which are added 10 to 20 parts of sand of different degrees of fineness, and sometimes gravel; after being air-dried, it is kept for five or six days in an apartment at 104°, when it becomes quite hard.]

10. Walker, George, *New York City.*—Agent.

Patent metallic mirror mantels, of cast iron and plate glass, manufactured by the Mirror Marble Co., Boston, Mass.

[See Illustrated Record, page 18.]

11. New York Marbled Iron Works, *New York City.*—Manufacturers.

Enameled, or imitation marble, iron mantels, columns, table-tops, slabs, etc.

12. Freund & Miller, *New York City.*—Manufacturers.

Richly decorated arch and columns, mantels, banister, urns, candelabra, work-boxes, table-tops, and other specimens of ligneous marble, or imitation of marble in wood and iron.

[There are various ways of imitating marble, besides *scagliola*, mentioned below. In marbleized iron, so called, the marbled appearance may be produced either by painting the design on the back side of a glass panel, or the iron may be painted and a solution of glass run over it. The process invented by Mr. C. Iles, of Birmingham, England, consists in mixing a cement, the basis of which is carbonate or sulphate of lime, with the waste materials of silk works, or the short cuttings from piled cloth and velvet; the mass forms a uniform or a variously colored mixture, as may be required, and the marble-like veins are formed by drawing out such silk threads as will best secure the effect desired. It is quite cheap, and durable, and admits of a fine polish, and is well adapted for interior work. Plaster casts may be rendered as hard as marble, by immersing them in a solution of alum; a similar hardness may be given by coating them with a liquid made of two parts of stearine and two parts of Venetian soap, mixed with 20 to 30 parts of a cold solution of caustic potash; after boiling for half an hour, one part of pearl-ash is added, and the heat continued for a few minutes; enough of the cold ley is added to produce perfect fluidity, and the liquid is allowed to stand under cover for several days. An artificial marble may be made by immersing gypsum or alabaster, cut of the required shape, thoroughly dried, in a warm solution of borax and supersulphate of potash, made by adding about a pound of the former and a quarter of an ounce of the latter to each gallon of water; after being dried, it is again immersed in a hot saturated solution of borax, to each gallon of which is added one-fourth of an ounce of the most concentrated nitric acid; when saturated, and dried, it will be found to be as hard as marble. Colors may be given by using the solution of borax with a dye, and the acid, or a nitrate. For instance, to produce a blue marble, a solution of borax, with indigo and nitrate of iron, may be used; to produce a compound-colored marble, the process of immersion in the boracic solution is repeated; for instance, the blue marble may be treated with safflaver, or any red dye, causing streaks, or veins, and patches of the blended or separate colors. Three or four colors may be produced in this way. This is a patent process of Mr. S. R. St. C. Massiah, of London, in 1850.]

13. Farley, H. S., *New York City.*—Manufacturer.

Scagliola, or cement marble columns, half antaes, and pedestals.

[Scagliola was invented in Lombardy, more than two centuries ago. It is made from a cement of the finest gypsum, in powder, mixed with aluminous matter, isinglass, and coloring matters; the surface which is to receive the paste has a rough coating of lime and hair. As the most beautifully-veined marbles are imitated in this, many shades of color are used, requiring great skill in their employment. Scagliola work resembles fresco painting, in that the colors are laid on and mixed in the wet state of the cement; the outlines of the work are traced with a sharp instrument, and the cavities are filled with the same material, of different colors according to the veins to be imitated. After the cement has hardened, it is rubbed with pumice-stone, and polished with tripoli and oil. It takes a fine polish, is as hard as marble, and very durable. Pieces of marble are sometimes inlaid, in the ordinary irregular patterns. The colors are apt to run together, from the moist state of the work, and the use of alum; and, from the nature of the material, it will not answer, unsupported, where strength is required.]

14. Young, Alexander, *New York City.*—Manufacturer.

Door and window frames, arches and columns, in terra cotta; chimney-tops, brackets, trusses, pinnacles, mouldings, and almost every article for construction or decoration that can be made of cut stone, of great variety of designs. These ornaments are more durable and cheaper than stone.

15. Quinn & Hill, *New York City.*—Manufacturers.

Chimney-tops, window lintels, consoles, garden vases, and various architectural ornaments, manufactured from an amalgam of clays burned to the hardness and durability of stone.

16. Roche, Edward, *New York City.*—Manufacturer.

Terra cotta cornices, arches, archivolts, brackets; vitrified stone drain-pipes; architectural ornaments.

17. Tolman, Hathaway & Stone, *Worcester, Massachusetts.*—Manufacturers.

Architectural ornaments and vases, in terra cotta. [For figures, see Record, pages 21 and 51.]

18. Winter & Co., *Newark, New Jersey.*—Manufacturers.

Terra cotta architectural ornaments, capitals, arches, window beads, sills, trusses, and consoles—remarkable for the accuracy of the joints and length of the pieces.

[The use of terra cotta for architectural and building purposes, is very important in an economical point of view. This material is exceedingly durable—indeed, it is almost indestructible by ordinary exposure to weather—and, though the color is inferior to that of stone, and the parts are liable to be warped in burning, it answers a most excellent purpose, both for decoration and construction. It should be made of clay, of great purity, containing but little iron, mixed with crushed pottery and calcined flints, or pure sand, and burned at a high heat. The ancient terra cotta was little more than a sun-baked clay.]

19. Forbes, Joseph D., *Perth Amboy, New Jersey.*—Manufacturer.

Specimens of fire-brick.

[Fire-clays abound under the coal measures. They are used for the manufacture of fire-bricks and gas retorts, where the material requires to be of such a nature as to resist fusion at high temperatures. Such clays are termed refractory, and are nearly pure silicates of alumina. The proportions of silica and alumina vary, the former ranging from 50 to 70 per cent. They should be free from alkaline earths and iron, which render the clay fusible at high temperatures.]

20. Smith, Washington, *New York City.*—Manufacturer.

Stone and earthenware drain-pipe, elbows, etc.

[Stone ware, such as is used for drain-pipes, is a perfect kind of pottery, approaching very nearly to a true porcelain. It is composed of clay and silex, and exposed to such a degree of heat as to produce a partial vitrification. A glaze is produced by throwing salt into the furnace, which is diffused over the whole surface, the soda combining with the silex to form a coating of glass.]

21. Connecticut Marble Company, *New Haven, Connecticut.*—Manufacturers.

Artificially variegated marble tables; impervious to oils, and unaffected by changes of heat and moisture.

22. Smith, Dr. William, *Philadelphia, Pennsylvania.*—Manufacturer.

Specimens of lava ware, manufactured from the slags of iron and other reducing furnaces; a new invention, patented in this country, and in Europe; used as a substitute for glass, stone, and clay, for ornamental tiles, bottles, etc.

23. Winslow, Thomas S., *New York City.*—Agent.

A gothic baptismal font, in Caen stone, on a base of Aubigny stone.

[These stones are imported from Normandy, France. When recently quarried, they are quite soft, becoming hard on exposure to the air. This property makes them valuable for decoration in architecture. The stone belongs to the oolitic series of rocks.]

24. Kirby & Cannan, *Brooklyn, New York.*—Manufacturers.

Relief, or projecting letters, for signs, tablets, etc., manufactured from a mineral composition, and finely enameled in gold and colors.

25. Goodridge, S. W., & Co., *New York City.*—Manufacturers.

Soapstone work—stoves, furnaces, wash-tubs, sinks, etc., remarkable for their capacity to resist heat.

[Soapstone (steatite, or saponite) is a hydrous silicate of magnesia and alumina; its color and consistence are well known. It is hardly affected by sulphuric or muriatic acids, and is but little altered by intense heat. It may be obtained in large blocks, without flaw, in various parts of the United States—in Vermont and New Hampshire, in New Jersey, and in Maryland. It is so soft as to be easily wrought, turned, and planed with the ordinary tools of the carpenter; and it may be screwed together as easily and as tightly as wood. It is much used for the lining of stoves and fire-places, for sinks, and for the baths and sizing-rollers used in cotton mills.]

26. Hydeville Slate Company, *Hydeville, Vermont.*—Manufacturers.

Slabs of manufactured slate, for roofs, floors, etc. Model of a house roofed with this slate.

[The qualities of slate which render it so useful are, its strength, it being about four times as strong as ordinary stone; and slabs of eight feet in length may be used of not more than half an inch thick. Its compactness and non-absorbent properties render it especially applicable as a lining for walls, and for vessels and passages exposed continually to water. Its smooth and perfect surface adapts it for ornamental and useful purposes, as chimney-pieces, table-tops, monuments, tablets, bathing-tubs, and the beds of billiard-tables.]

27. Daniel, Charles B., *Bethlehem, Pennsylvania.*—Manufacturer.

Model of a house roofed with Blue Mountain slate.

28. Taylor & Porter, *Slateford, Pennsylvania.*—Manufacturers.

School and counting-house slates, for blackboard uses; roofing slates.

[The slates are procured from the "Pennsylvania Slate Quarry," on the river Delaware, near the Delaware Water Gap, in Northampton county. The quarry has been worked about 47 years, and the supply seems inexhaustible. The roofing slate is manufactured of sizes varying from 24 by 12 inches to 10 by 5 inches; sometimes the width is increased to more than half the length, when the material will allow it. The amount manufactured is about 2,000 tons a year. About 18,000 school slates are also made annually.]

29. McDowell & Co., *Slatington, Pennsylvania.*—Manufacturers

School and counting-room slates; roofing slates.

[This slate is obtained from the Kittatinny Quarries, Slatington, Pennsylvania;

they have been worked for eight years, and the supply seems inexhaustible. Four hundred thousand superficial feet have been produced in one year. The color is of a clear dark-blue.]

30. Felt, Willard, *New York City.*—Manufacturer.
Specimens of school-slates.

31. French, William H., *Philadelphia, Pennsylvania.*—Manufacturer.
Plaster ornaments for exterior and interior of buildings.

32. Gawy, Andrea J., *New York City.*—Manufacturer.
Architectural plaster ornaments for the interior of buildings.

33. Bail, Lewis, *New York City.*—Manufacturer.
Elaborate capital for Grecian column, modeled in plaster.

34. Watson & Hodgson, *New York City.*—Manufacturers.
Center ceiling-pieces, flowers, friezes, soffits, and other architectural ornaments in plaster of Paris.

35. Heath, Thomas, *Philadelphia, Pennsylvania.*—Designer and Manufacturer.
A very elaborate new lyric center-piece, in plaster of Paris. (See the Illustrated Record, page 201, for figure.)

[The basis of plaster of Paris (so called from the vast quantities found in the neighborhood of Paris) is gypsum, or sulphate of lime, which contains about twenty-four per cent. of water. On being burned at a low temperature it parts with its water, which it absorbs again with great avidity; this is the basis of a great number of important uses to which this substance is put. When mixed with water, after being calcined, a hydrous sulphate of lime is formed, which rapidly becomes hard; if the solidification takes place in a mould, the most minute cavities are exactly filled, forming a perfect cast from the expansion which takes place during the solidification. *Stucco* is a combination of gypsum, which generally contains carbonate of lime, with gelatine or strong glue; this composition dries more slowly than that made with water, but is harder and more durable, and is much used for interior decorations. The hardness may be still further increased by moistening the calcined gypsum with a solution of alum or of borax, one pound to nine pounds of water, and heating strongly.]

GREAT BRITAIN AND IRELAND.

36. Herbert Minton & Co., *Stoke-upon-Trent.*—Manufacturer.
Encaustic and Venetian tiles for floors and walls, tablets for names of streets, &c. (For figures of the tiles see the Record, pages 51 and 156.)

[The use of hardened clay for pavements is of great antiquity; while the forms and patterns of ancient tiles are now used, the modern makers have introduced great mechanical improvements in the manufacture. The tiles of the Messrs. Minton are made by pressing in moulds. Ordinary paving tiles are of a red or buff color; various colors are produced by the metallic oxyds. The clay in the state of a fine powder, retaining a certain amount of moisture, is placed in a mould of the desired form, when the ram of a hydraulic press is brought down upon it with a pressure of from 200 to 250 tons; the clay is much compressed, and, on being removed from the mould and smoothed, is baked. In making the encaustic or variegated tiles, an ordinary buff tile is first made, in a mould which leaves impressions in the soft clay about one-fourth of an inch deep; after being partly dried, variously colored clays are poured over the tile at a thick slip; this also being partially dried, the surface is scraped till the common buff tile is seen, and the pattern appears in the proper colors; the tile is then fired, which brings out the colors more vividly. The Venetian tiles and mosaics are called tesseræ; they are produced by pressure in metal dies, of any desired geometrical form; each tile is of the same color throughout. When fired they are placed face downwards; the back is formed of Portland cement, a mixture of carbonate of lime and silicate of alumina.]

37. Tomlinson, John, *Ashford, Derbyshire.*—Manufacturer.
Black marble inlaid-table, vases, cups, and fancy articles.

38. Vallance, John, *Matlock, Derbyshire.*—Manufacturer.
Tables, tazzas, vases, &c., composed of or inlaid with marbles and fluor-spar from Derbyshire.

[The Derbyshire marbles are obtained from the carboniferous limestone, and are colored by carbon and metallic oxyds; they are sometimes fossiliferous, containing corals, encrinital stems, and shells; they are also oolitic, crystalline, and veined. Marble mosaic is made in Derbyshire by chiseling out the marble, and inlaying it with marbles of a different color, with fluor-spar, and glass. Fluor-spar is a fluoride of calcium (generally called fluate of lime), occurring in veins in the carboniferous limestone, associated with calc-spar; it is found in a crystalline form, and in groups of cubic crystals. The natural colors are pale and dark-violet, blue, and yellow; other colors are given artificially by means of heat and sulphuric acid. From the ease with which the laminæ are split it is very difficult to turn; this is accomplished by heating it and applying yellow resin over the surface, which penetrates about one-eighth of an inch, and holds the crystals together; by a repetition of the resining process the turning is gradually completed by the steel point. The blue variety is by far the most valuable, and is locally called "Blue John;" from its comparative variety, many means are resorted to for the production of the amethystine and blue colors. When skillfully worked the colors are exceedingly beautiful.]

39. Love, Thomas, *London.*—Manufacturer.
Tables and boxes in imitation marble; a set of chess-men.

40. Dawbarn, William, & Co., *Liverpool.*—Manufacturers.
Framed writing-slates from the Bangor slate quarries, North Wales; roofing slates, slate pencils, Welsh hones.

BRITISH COLONIES.—CANADA.

41. Morgan, James, *Quebec, Canada East.*—Designer and Manufacturer.
A baptismal font of Pictou stone, in early Gothic style.

NEWFOUNDLAND.

42. Bennett, C. F., *St. John's.*—Manufacturer.
Manufactured slate.

43. Knight, *St. John's.*—Manufacturer.
Manufactured slate.

FRANCE.

44. Heiligenthal & Co., *Strasburg.*—Manufacturers.
Ornaments in stone mastic for decorations.

[These ornaments and mouldings are made by means of metal moulds; the paste or mastic, in a soft state, is pressed into them by very heavy weights, which gives them a hardness and polish which allows of their being gilt. They are used principally for interior decoration, but by being covered with a coat of copal varnish they may be used as external ornaments. They have been known to withstand all kinds of weather for twenty-five years.]

45. Baudouin, Brothers, *Paris.*—Manufacturers.
Slabs of painted asphaltum.

[Asphaltum is a black bituminous substance, very brittle and inflammable; it is found of great purity and in immense quantities in New Brunswick; in France it is associated with limestone, the rock containing about eighty per cent. of carbonate of lime, and twenty per cent. of bitumen. The use of asphaltum in paving originated in France, where it has been used more extensively and successfully than in England or in this country. This rock may be converted into a plastic mass very readily and cheaply, merely by the addition of six or eight per cent. of mineral or coal-tar, and a few pebbles and sand; the union is effected by a moderate heat in an iron vessel, and the mass is spread on a flat surface previously prepared for it, or run in moulds into blocks weighing about 100 lbs. The advantages of this pavement are its toughness and power of resisting wear; its impermeability to water; its freedom from dust and mud; and the ease with which it may be repaired, it being only necessary to warm the worn part, cut it out with a knife, and fill up the opening with freshly melted material. Various ornamental designs are made by pressing differently colored stones into it, and by coloring it in figures previous to dryness.

The material has also been used for roofs, as coverings for bridges, roads, &c. Asphaltum foot-pavements have not met with much success in this country, probably from some defect in their composition; in Philadelphia they were worn through in a few years, or rendered unsightly by softening in the summer's sun and running over the curb-stone. From an experiment made in Philadelphia some years since, it would appear that a very durable pavement may be made by boiling coal-tar down to pitch, and thickening it with sand.]

46. Liezching & Torasse, *Paris.*—Manufacturers.
Tables with mosaic tops.

THE GERMAN STATES.

47. Barrata, Carlo.—Manufacturer.
White marble center-table.

48. Hutschenreuter, H. A., *Wallendorf.*—Manufacturer.
Slates and metallic tablets.

49. Schwartz, F. A., *Solenhofen, Bavaria.*—Manufacturer.
Lithographic stones.

[Lithographic stones are fine-grained limestones; the best are procured in the neighborhood of Munich, Bavaria, at Solenhofen, where lithography originated. The good qualities of a lithographic stone are: a uniform yellowish gray hue; freedom from veins and spots; a steel point should cut it with difficulty; and splinters from it should have a conchoidal fracture. Lithographic stone has been found in Canada by Mr. Logan in a palæozoic formation; at Marmora this stone occurs in beds from one to two feet thick, and apparently over an extent of seventy miles. Slabs of all ordinary sizes might be obtained from this place.]

THE AUSTRIAN EMPIRE.

50. Ramsaner, J. G., *Hallstadt, Upper Austria.*—Manufacturer.
Candelabra, vases, table-slabs, mirror-frames, and various other objects in variegated marble.

51. Christofoli, Antonio, *Padua, Lombardy.*—Manufacturer.
Marble and mosaic table; pavement slabs.

52. Motelli, Gaetano, *Milan, Lombardy.*—Manufacturer.
A white marble mantle in Anacreontic style.

53. Franzi, Giuseppe, *Milan.*—Manufacturer.
Table and chairs, and monumental tablet of carved piggin stone.

54. Rohlik, L., *Prague, Bohemia.*—Manufacturer.
Specimens of work in artificial marble; a small lion, and a bas-relief.

55. Hardtmuth, L. & C., *Vienna.*—Manufacturers.
Specimens of artificial pumice-stone.

56. Scharas, John, *Vienna.*—Manufacturer.
Artificial pumice-stone.

THE ITALIAN STATES.

57. Bosi, Enrico, *Florence, Tuscany.*—Manufacturer.
Table-tops of different shapes, with radii of variegated marbles, and centers and borders of flowers.

58. Fontana, Pietro, *Carrara, Modena.*—Manufacturer.
Pair of vases of white statuary marble.

59. Livi, Vincenzo, *Carrara, Modena.*—Manufacturer.
Mantel-piece of statuary marble.

60. Pacchiani, F., *Florence.*—Manufacturer.
Mantel-piece of statuary marble, with bas-relief of Guido's Aurora.

61. Nanni, Leonardo, *Florence.*—Manufacturer.
A slab of green Prato marble; a round table-top.

[This is a name given to serpentine, a silicate of magnesia, found near the town of Prato, in Tuscany. The quarries yield blocks of very large size, of good quality, and seemingly in inexhaustible quantity; they are in active operation. Serpentine is found in abundance in this country, in New Jersey and Vermont.]

62. Zolezzi, Stefano, & Son, *Lavagna, Sardinia.*—Manufacturers.
Slate table, polished; roofing slates and slates for pavements.

63. Andreoli, C.—Manufacturer.
Various fruits imitated in marble.

64. Trebbi, Odoardo, *Rome.*—Manufacturer.
Mosaic table and vases in fine marble and alabaster; two columns in Oriental granite, with marble capitals; a pavement of Roman mosaic in "pietra dura."

65. Solari, Ottavio, *Florence.*—Manufacturer.
A pair of alabaster candelabra.

[Alabaster is a sulphate of lime, a compact gypsum. The finest varieties are found abundantly in the north of Italy, near Leghorn, which is the chief seat of the manufacture of alabaster ornaments. It is much softer than marble, and when first raised is quite soft and easily wrought by the most simple tools. Oriental alabaster is a stalactitic carbonate of lime, of all colors from white to brown, and sometimes veined; it is as hard as marble, and is used for similar purposes; it was much used by the ancient Egyptians for sarcophagi.]

66. Spanna, Giuseppe, *Turin, Sardinia.*—Manufacturer.
Specimens of artificial marble of various forms and colors.

67. Collonello, F., *Genoa, Sardinia.*—Manufacturer.
Mosaic marble slabs.

68. Bianchini, Gaetano, *Florence.*—Manufacturer.
Fine tables in Florentine mosaic.

69. Betti, Francesco, *Florence.*—Manufacturer.
An oblong table slab in Florentine mosaic, with center and border of flowers. [For figure see page 98 of the Record.]

BELGIUM.

70. Requile, Brothers, *Brussels.*—Manufacturers.
An engraved slab of black marble.

[Black marble is etched with various figures, generally after it is polished. The parts to be preserved are penciled over with a colored varnish; the uncovered surface of the marble is then dissolved with dilute muriatic acid; after the acid is washed off with water, and the varnish removed by turpentine, the engraving appears of a dull gray color on a black ground. The graver is also employed conjointly with this etching process.]

71. Smal, Werpin, *Huy.*—Manufacturer.
Specimens of fire-brick ornaments and drain-pipes.

THE NETHERLANDS.

72. Swann, E., *Arnhem.*—Manufacturer.
White marble vase.

73. Vermel, T. S., *Rotterdam.*—Manufacturer.
A carved slab for a mantel-piece; representing the American eagle in white marble, on a light slate-colored marble ground, surrounded by thirteen golden stars.

74. Van Hulst, J., *Hurlingen.*—Manufacturer.
Square tiles for walls and floors.

75. Scholer & Son, *Utrecht.*—Manufacturers.
Bricks and cement.

[There are several kinds of mosaic, but all of them consist in imbedding fragments of different colored stones, gems, marbles, and even glass, in a cement, so as to produce the effect of a picture. It is a very ancient art; the finest specimens of it are new, and have long been made in Florence. For an essay on this beautiful art, see the Record, page 83.]

76. Van den Brocke, P., *Utrecht.*—Manufacturer.
Specimens of bricks.

SECTION III. CLASS XXVIII.

MANUFACTURES FROM ANIMAL AND VEGETABLE SUBSTANCES, NOT WOVEN OR FELTED.

THE constitution of the present Class is somewhat peculiar. It contains those articles of animal and vegetable origin which, not being woven or felted, could not be included among the results of such processes. The applications of caoutchouc and gutta percha; the manufactures of ivory, horn, and whalebone; and of cocoa-nut fibers, cork, &c., are sufficiently numerous to form no inconsiderable part of civilized industry, and of its representation in the New York Exhibition. Especially is this true of the articles made from caoutchouc. All those properties which limit its use in the natural state are no longer present in the combination of sulphur and caoutchouc called vulcanized India-rubber. This transformation of caoutchouc was invented and first applied to practical purposes in America in the year 1836, by Mr. Charles Goodyear. The same inventor has lately combined caoutchouc with sulphur and magnesia, which impart the hardness and other qualities of wood. Being plastic, it may be moulded into a multitude of forms, and it receives any color or combination of tints. To the former almost endless variety of objects manufactured from this Protean substance, a new series of combs, canes, buttons, &c., is thus added. A most interesting collection of these objects is shown by the various American and foreign exhibitors.

A great number of the small manufactures of Switzerland may be found in this Class. The articles exhibit great ingenuity and skill in wood-turning and carving. They are already familiar from the numerous specimens brought here by travelers as souvenirs of their visits. The manufactures of ivory, tortoise-shell, straw, &c., exhibit their usual characteristics.

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1. SHARDLOW, SAMUEL, *New York City.*—Manufacturer.

Ivory, billiard, and pool balls; martingale, napkin, and teething rings; sand, pounce, and fancy boxes; wafer-stamps, pen-holders, chess-men, counters, cheeks, cane-heads, and other articles in ivory; curious box of many kinds of wood, containing relics.

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2. PRATT, WEBB & Co., *New York City.*—Manufacturers.

Pyramid of ivory combs and other articles in ivory; tablets, paper-cutters, and rings.

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3. FENN, JOHN, *New York City.*—Manufacturer.

Assortment of fine ivory combs; combs in tortoise-shell and Turkey box; tablets in ivory, pearl, and tortoise-shell; fancy articles in ivory, rosewood, &c.

[Ivory, the tusk of the elephant, is intermediate between horn and bone, both in its chemical and mechanical properties; it has less gelatine than bone, and is less brittle. The tusk of the elephant is generally solid for half its length, and is free from the pores met with in bone; though it contains sixty-four per cent. of phosphate of lime, it may be worked with perfect smoothness; it is therefore far superior to bone, and altogether the best material for ornamental turning. The general supply of ivory is from the Asiatic and African elephants; though in Russia almost all the ivory is obtained from the Siberian mammoth, or fossil elephant, whose tusks are found abundantly in eastern Siberia and the arctic marshes; the latter is not inferior to, and is cheaper than the recent ivory. The tusks of the hippopotamus, of the walrus, and of the norwal, and the teeth of the sperm whale, are also used as ivory; the first-mentioned is much harder than elephant ivory, and of double the value. The best ivory is brought from the eastern coast of Africa. The slaughter of elephants to supply the world with ivory must be immense; as long ago as 1830, according to McCulloch, Great Britain alone consumed over 416,000 lbs.; allowing 20 lbs. to be the average weight of a tusk as imported, this would require the sacrifice of more than 10,000 of these noble animals; what then must be the destruction to supply the world in 1854? Some tusks will weigh 150 lbs., and from that down to 10 lbs., and even less, varying in length from eight and ten feet to as many inches. A section of true ivory may always be known by the decussating curved lines, resembling engine-turn markings.

On account of the curved form of the tusk in the direction of its length, its hollowness for about half its length, its gradual taper, and its elliptical or irregular section, it requires considerable skill to cut it economically. The only waste should be from the passage of the saw; the refuse tips are of use in making ivory-black. Ivory requires a drying similar to wood; and articles turned from it should not be exposed to much heat, else they will warp. Ivory changes in length as well as in width, so that drawing-scales made from it cannot be depended on for exact measurements; the effect of shrinking is often seen in billiard-balls, which soon show a difference in the two diameters, if they are subject to changes of temperature, or are made of imperfectly seasoned materials.

Ivory is apt to get discolored, and many methods are advised to restore the color; most of these are useless, or, if effectual, injure the material, and destroy delicate articles. The best way to preserve the color is by exposure to the light, and close covering with a glass shade. Ivory cannot be softened, like horn or shell, and moulded into any desired shape—alkalies, if sufficiently strong, will completely decompose it; in hydrochloric acid solutions, ivory becomes flexible and elastic, the earthy matters being removed, and in this state is available for many of the purposes of the surgeon. Ivory may be dyed of various colors, by the processes applied to other materials; these should be applied before polishing. Ivory may be very economically and beautifully employed in the form of thin veneers, attached to wood by means of an alcoholic solution of isinglass. Artificial ivory is made by a French patent process, which consists in steeping the waste pieces and turnings in acid solutions; but it looks more like an opaque cement than like ivory. Ivory which has become friable from age is said to recover its original hardness by being boiled in a solution of gelatin.

What is called *vegetable ivory*, is obtained from the nuts of a dwarf palm tree, allied to the screw-pines, which has been named *Phytelephas macrocarpa;* it grows abundantly in the valleys of the Andes, and was first brought into notice by Humboldt. It produces its fruit in large round heads; the nuts are of irregular shape, one to two inches in diameter, and, when inclosed in their husks, looking like small potatoes, covered with a light-brown earth. The internal substance (analogous to the flesh of the cocoa-nut), which has been called an *osseous albumen*, is of a white-wax appearance, but quite hard; it is used for many ornamental purposes in turning; the small size of the nut, its irregular shape, and central cavity, limit the use of it to small objects, such as the heads of canes, and fancy articles, more valued as curiosities than as really useful.]

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4. MEYER & POPPENHUSEN, *New York City.*—Manufacturers.

Specimens of manufactures in whalebone and artificial whalebone; canes and patent veneers.

[Whalebone has nothing in it of the nature of bone, but is an albuminous tissue, resembling horn and hair, and, as it were, forming the transition between these two substances. This substance answers the purpose of retaining the small mollusks and crustations contained in the water which enters the mouth of the whale, by the fringe-like bristles which project from the central part of the plates. The principal supply is obtained from the Greenland and Southern whales, *Balœna mysticetus* and *australis*. From the roof of the mouth hang down on each side of the tongue about 300 plates of whalebone, or *baleen*, as it is properly called; these are at right angles to the jaw-bone, and the largest of them parallel to each other; the average length of the middle blades is about nine feet, but they have been found as long as fifteen feet; the largest plates being the most external, the form of the baleen-covered roof of the whale's mouth is a transverse arch, in which rests the convex upper surface of the tongue when the mouth is closed. Each plate, on its inner and oblique margin, sends off a fringe of rather stiff, but flexible hairs, which project into the mouth; this will explain the passage in Aristotle's "Historia Animalium," in which he says, "the whale has in its mouth, instead of teeth, hairs resembling hog's bristles."

Its preparation for use consists in boiling it in water for several hours, which renders it soft when hot; this process also renders it harder when it is cold, and of a darker color; the jet-black color is the result of a dyeing process. Whalebone is used principally for the stretchers for umbrellas, for canes, whips, and as a substitute for bristles in common brushes; in the form of shavings, it is sometimes braided into hats and bonnets. It cannot be used with advantage on very extensive surfaces, as it cannot be soldered or joined together like tortoise-shell. When softened by heat, it can be bent and moulded, like horn, into various shapes, which it retains, if cooled under the pressure. The surface is polished with ground pumice-stone, felt, and water, and finished with dry-sifted quicklime.]

5. Losdell, H. C., *Brookfield, Connecticut.*—Manufacturer.
Imitation tortoise-shell combs of every style; carved horn and buffalo combs; ladies' dress combs.

[The appearance of tortoise-shell may be given to horn, by brushing it over with a paste, made of two parts of lime, one part litharge, and a little soda-lye, which is allowed to dry. This is the same as the Indian hair-dye, and acts by forming sulphuret of lead with the sulphur contained in the albumen of the horn, producing dark spots which contrast with the lighter color of the horn.]

6. Houghton & Daniels, *Holliston, Massachusetts.*—Manufacturers.
An assortment of horn combs.

7. Claflen, Oaren, *Providence, Rhode Island.*—Manufacturer.
A variety of fine turtle-shell combs, of new patterns and designs.

[Tortoise-shell is obtained from the sea-turtles, in which it forms the plates covering the back, overlapping each other in an imbricated manner, The most valuable is obtained from the *Chelone imbricata* and *C. caretta*, living in the seas of tropical America. Five large plates are obtained from the middle of the carapace, and four large ones from the sides, called "blades;" and twenty-five smaller plates from the edges, called "feet" or "noses." In an animal of the ordinary size, about three feet long and 2½ wide, the largest plates will weigh about nine ounces, and measure about thirteen by eight inches, and one-fourth of an inch thick in the middle; the belly-shells are of a yellow color, and are used for the purposes of horn. East Indian tortoise-shell rarely comes to this market. On the application of heat, generally by boiling water, the shell becomes soft, and may be compressed into any form. Works in this material are made, either by cutting them out of the shell, or by soldering when softened by heat. The teeth of large combs are cut, one out of the other, with a thin frame-saw, so that two combs of equal size are made from a portion of shell of given length. Tortoise-shell is often veneered upon a body of wood, scraped to a uniform thickness, and attached by fine glue; the colors are rendered darker or brighter, by various coatings of colored varnish, or of metallic leaf, placed under the veneer.]

8. Colburn, Alvin, *Leominster, Massachusetts.*—Manufacturer.
Spoons and scoops made of horn.

9. Pausy, William, *Strattonport, New York.*—Manufacturer.
An assortment of fine shell and buffalo-horn combs.

[Under the term "horn" are included two very distinct substances. The horns of the deer, more properly called "antlers," are solid processes from the frontal bone, and possess the chemical and physical properties of true bone. After being sawn and filed to the required shape, the exterior is left in its rough natural state, which, besides being ornamental, is well adapted for the handles of knives and instruments requiring a firm grasp; in the German States, very pretty and delicate objects are carved from this material. This kind of horn is periodically shed, by the absorption of the bony base, after which a new pair grows with great rapidity; the red deer will develop a pair of horns, weighing twenty-four pounds, in about ten weeks.

The horns of the ox, buffalo, &c., are hollow, and are never shed; they are deposited in layers, or bony cores, so that the general form is conical. These differ from antlers in being composed principally of albumen, with a little gelatin, and a small proportion of phosphate of lime; they are thus not brittle like bone, and possess sufficient gelatin to allow of their being softened, and of being joined by heat, moisture, and pressure, the gelatin serving as a natural solder, and securing a permanent union. The separation of the bony core is effected by maceration in water; the tip of the horn is sawn off, and the remainder softened in boiling water and by fire, when it becomes very soft, and is easily opened by the knife, and pressed into a flat shape. It is readily pressed in moulds, when softened by heat.]

10. Hart, Samuel, & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Mother-of-pearl card-cases, work-boxes, tablets, and other fancy articles.

11. Stenton, Robert S., *New York City.*—Manufacturer.
A variety of articles in pearl; knife-handles, tablets, carved candlesticks, and the rough material.

[Pearls are the results of an excretion in concentric layers in the pearl-oyster (*Meleagrina margaritifera*), of the Indian seas; what is called "mother-of-pearl" is the internal layer of such shells, and also of the *Haliotis* and some *Unios*. The iridescent appearance of pearl is attributed to the laminated structure, which decomposes and reflects the light from the surfaces of its minute furrows. After being cut from the shell, the pieces are ground flat on a wet grindstone with a grooved edge. Polishing is effected by means of pumice-stone, putty-powder, and buff leather, covered with rotten-stone.]

12. Hyde, H. W., *New York City.*—Manufacturer.
Various articles in turned ivory and hard-wood.

13. Fountain, J. P., *New York City.*—Proprietor.
Ivory crucifix and Chinese articles.

14. Armitage, James, *New York City.*—Manufacturer.
Fancy articles in ivory and wood, as silk and cotton stands, emery cushions, thimble-cases, wax and silk spools, drawer-knobs, &c.

15. Tiercelin, *New York City.*—Manufacturer.
A variety of brushes, for artists and painters.

16. Steer, James T., & Co., *New York City.*—Manufacturers.
Specimens of common and iron-bound paint and varnish brushes.

17. Drais, William P., *Philadelphia, Pennsylvania.*—Manufacturer.
Wheel-brushes for polishing enameled teeth, jewelry, &c.

18. Chapin, William, *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of brushes and fancy bead-work, made at the Institution for the Blind, Philadelphia.

19. Relay, Robert H., *Lansingburg, New York.*—Manufacturer.
Shaving and sash brushes.

20. Parker, J. M., *New York City.*—Manufacturer.
An assortment of wheel-brushes for jewelers and brass-founders.

21. Murrow, Freeman, *Williamsburg, New York.*—Patentee and Manufacturer.
Patent adjustable brush, with handles adapted to white-washing, painting, varnishing, dusting, and washing walls, cornices, and windows. By means of adjustable joints the brush can be fixed at any desired angle.

22. Goodyear, Charles, *New Haven, Connecticut.*—Proprietor.
A great variety of India-rubber fabrics, consisting of garments, shoes, canes, combs, toys, knife-handles, brush-tops, brooches, gloves, bottles, life-preservers, &c.

23. New York Rubber Company, *New York City.*—Manufacturers.
Fancy India-rubber goods in great variety; balls, dolls, toys, and other fancy articles.

24. Goodyear India-Rubber Gum Company, *Naugatuck, Connecticut.*—Manufacturers.
Specimens of India-rubber.

25. Rogers & Wyckoff, *New York City.*—Manufacturers.
Specimens of India-rubber shirred webbing, and various articles made of India-rubber cloth.

26. North American Gutta Percha Company, *New York City.*—Manufacturers.
A variety of articles manufactured of gutta percha; coats, aprons, hats, bags, table-cloths, bolsters, bottles, cups, and such articles as are usually made from India-rubber.

27. Goodyear Packing-Rubber Company, *Newtown, Connecticut.*—Manufacturers.
India-rubber packing valves for steam-engines; water and air-pumps.

28. Allen, H., *Allensgrove, Wisconsin.*—Manufacturer.
Waterproof mail-bags.

29. Armstrong, S. T., *New York City.*—Manufacturer.
Specimens of sub-marine telegraph-wire, with gutta percha coating. Serial tubing of gutta percha for carrying water under rivers. Specimens of sub-marine wire, now in use under the Straits of Dover and the Irish Channel.

30. Lockwood, C., *New York City.*—Manufacturer.
Children's carriages, propellers, rocking-horses; sheepskin-mats, baskets, brooms, and woodenware.

31. Hall, M., *New York City.*—Manufacturer.
Turned wooden boxes for druggists.

32. Edmonds, Alexander, *Mount Pulaski, Illinois.*—Manufacturer.
Horological cradle, or "Mothers' Help."

33. Storms, A. J. & H. E., *Nyack, New York.*—Manufacturers.
Wash-tubs, buckets, churns, and various other articles of cedar wood-ware.

34. Kimball & Sawyer, *Bedford, Massachusetts.*—Manufacturers.
Specimens of pegs for boots and shoes.

35. Burdick, James M., *Fort Ann, New York.*—Manufacturer.
Variously mounted walking-canes, snuff-boxes, and other articles made from the wood of the famous Jane McCrea tree.

36. Woodburn, Jacob, *St. Louis, Missouri.*—Agent.
Spokes from the St. Louis Spoke Factory.

37. Boies, Leland & Co., *Norwich, Connecticut.*—Manufacturers.
Tool-handles, of irregular forms.

38. Williams, William E., Jr., *New York City.*—Manufacturer.
A fancy basket, carved out of a cocoa-nut shell.

39. Parker, Henry L., *East Lyme, Connecticut.*—Manufacturer.
Caulker's mallet and set of chisel-handles, made of live oak.

40. Wood, George, *Hackensack, New Jersey.*—Manufacturer.
Dovetailed block to exhibit workmanship.

41. Chaplain, Charles L., *Newark, New Jersey.*—Manufacturer.
Hatchet, ax, and tool handles of wood; wheel-spokes and whiffle-trees, turned by machinery.

GREAT BRITAIN AND IRELAND.

42. Hallamby, Henry, *Tunbridge Wells, Kent.*—Manufacturer.
Tunbridge ware: an inlaid chess-table, containing 200,000 pieces of naturally colored woods; writing-desk, with 80,000 pieces; work-box, with 100,000 pieces; tea-caddy; knitting-box, &c.

43. Wise, George, & Co., *Tunbridge Town, Kent.*—Manufacturers.
Many varieties of inlaid and mosaic Tunbridge ware; table, stands, boxes, desks, and fancy articles.

44. Wright, Miss Gertrude, *Moneymore, Ireland.*—Manufacturer.
Specimens of wood carvings.

45. Petts, James, *Essex, England.*—Designer and Manufacturer.
A carved cane in wood.

46. Woodman, Joseph, *Birmingham.*—Manufacturer.
Various kinds of brushes.

47. Wildey & Co., *London.*—Patentees and Manufacturers.
Specimens of the fiber of the cocoa-nut husk, in various stages of preparation; mats and netting; brushes.

48. Treloar, Thomas, *London.*—Manufacturer.
Various samples of floor and door-mats, made of cocoa-nut fiber. (See note on cocoa-nut fiber in Class XIX., page 7 .)

49. Kolle, Henry, & Son, *London.*—Manufacturers.
Cocoa-nut fiber and horse-hair fabrics: coir yarn, mats, and stuffing for upholsterers; Spanish grass yarn; hair-cloth for petticoats and coat paddings; for seating, brushes, weaving, upholstery; ropes for laundry purposes.

50. Chittenden, Richard, *Buxhill, Sussex.*—Manufacturer.
A truck-basket.

BRITISH COLONIES.—CANADA.

51. McKinsty, M., *Baie de St. Paul, Canada East.*—Manufacturer.
A bunch of straw plait.

52. Martel, Madeline, *St. Ambroise, Canada East.*—Manufacturer.
Specimens of straw plait.

53. Lecomte, Saleur, *Quebec, Canada East.*—Manufacturer.
Two straw boxes.

54. Parker, William, & Co., *Huntersville, Canada East.*—Manufacturers.
A bundle of shingles.

55. Moore, Thomas, *Thornhill, Canada West.*—Manufacturer.
Specimens of ax-handles.

56. Dubean, Joseph, *Quebec, Canada East.*—Manufacturer.
A pair of hooped wooden bottles.

57. Schiller, Miss Caroline, *Montreal.*—Manufacturer.
A large box of bark, elaborately worked with moose-hair.

BRITISH COLONIES.—GUIANA.

58. McClintock, W. C., *Pomeroon.*—Proprietor.
A variety of Indian manufactures, including—

A woodskin, or canoe, made of the bark of the purple-heart tree; the Indians take off the bark when it is freshly cut, and easily convert it into canoes, some of which will carry thirty persons with safety in smooth water. Baskets, made by the Warrow and Arawaak Indian women. Buck-pots; the name "buck" is an epithet applied by the aborigines to any article made by them. Red-dye, in joints of bamboo, used by the Indians to paint themselves. Fans, made from the spire of the Acuyuri palm. Flutes, made of bamboo. Water-bottles; earthenware gongs; and hammock, made of the spire of the Ita palm, used by the women for carrying their children. A shield, or haha, used by the Warrow Indians in their festive games. A maraka, or magical gourd, made and used by the Arawaak Indians, who imagine that a sorcerer, by shaking this over a sick person, and at the same time chanting an address to the evil spirit, "Yahahas," can surely restore him to health. A macquari whip, made of threads of the spire of the Ita palm, and used by the Arawaak Indians at their great macquari, or funereal dance. This is a trial to test the power of enduring pain. One of the combatants, standing firmly on one leg, puts forward the other, which his opponent lashes with the whip, with all his force, till the pain can be no longer endured, which is generally only when the limb is severely cut; the whipper then becomes the one to be whipped. A cassava-squeezer. Mats for the table, made from the Itareti rush. A bead-necklace. A packall, or pagala, made from the Koquerite palm; packall, a nest of six. Smoking-pipes, made of bamboo. Shaak-shaaks; children's toys, and used by the Indians in their dances. Sticks, made of letter-wood. Net-work, or spathe of Troolie palm, used by the Warrow Indians for caps. Broom, made from the fruit-stalk of the manicole palm.

59. Cullen, John, *Pomeroon.*—Proprietor.
Small and medium-sized buck-pots; this is a specimen of the pottery of the Indians, resisting well the action of fire, and is the vessel in which their favorite dish, "pepper-pot," is prepared. Accaway beads. Warrow baskets. Models of canoes. Spun cotton. Fans made from the spire of the Acuyuri palm. Fishing-line, made of silk-grass (*Bromelia?*). Bamboo flutes. Goglets; porous vessels, used throughout the colony for containing and cooling water. Cotton hammock; hammock-ropes, made of silk-grass and Ita palm. Haha, or shield. Macquari whips. Small cassava-squeezers. Natta, or harpoon, for spearing fish, made of the mid-rib of the leaf of the Ita palm, and used by the Warrow Indians for spearing the Morocote fish, or Ossihu; in order to attract the fish to the shore, a few seeds of the carapa, or crab-nut, are pounded and inclosed in a net, and put into the water; the fish are soon attracted to the spot, and are easily speared. Paddles used by the Maiougkong tribe. A square-sail, made of the mid-rib of the Ita palm; it is sliced into laths, and secured by threads, and is used by the Warrow Indians only. A shaak-shaak. Sticks for obtaining fire by friction. Warrambi-sifters, made of Ita palm, and used for sifting cassava-meal.

60. Brotherson, E. S., *Demarara.*—Proprietor.
A bamboo, with pen and paint for the face. A cassava-squeezer. An Indian club. A necklace of peccary teeth. Necklace of Job's tears, the seeds of *Coix lacryma.* Saraqua, or flute, of bone of Puma. Shaak-shaaks. Torches made of Mannaballi, or torch-wood. Cassava-sifter. Indian fans. Accaway pots. Yarracoom, or cap, made of wicker-work and feathers.

61. Holmes, W. H., *Demarara.*—Proprietor.
A model of buck-house, with furniture and utensils.

62. Taggart, John, *Demarara.*—Proprietor.
Bows and arrows; war-clubs.

63. Donald, James, *Demarara.*—Proprietor.
Bows and arrows; Indian hat and feathers; queu; war-club.

64. Fuge, F., *Demarara.*—Proprietor.
Bows and arrows, fans, whips, cassava-squeezer, and shaak-shaaks.

65. Cartwright, H., *Demarara.*—Proprietor.
Buck-pots; goglets.

66. Wilday, Charles, *Demarara.*—Proprietor.
Blow-pipe and quiver.

[The inner tube of the blow-pipe is a single internode of the *Arundinaria Schomburgkii*, Benth. These internodes are sometimes sixteen feet long. The arrow is inserted into the tube, having a dossil of cotton around its lower end; aim is taken and the arrow is projected by a sudden expiration. Accompanying the quiver, there

is the maxilla of a fish, which is used for partially cutting the poisoned end of the arrow, so that this portion may break off, and remain in the wound; the cutting is effected by rapidly turning the arrow between the teeth of the maxilla. The poison used is the *wourali* poison, obtained from a gourd-bearing vine, the juice of which is mixed with roots and bulbous stalks, over a fire; many other ingredients, as black ants and snakes' fangs, are added, from superstitious motives; the juice of the wourali is probably the only active agent, and, in a concentrated form, it is perhaps the most powerful poison known.]

67. Ling, W., *Demarara.*—Proprietor.
Painted calabashes; the fruit of the *Crescentia cujeta.*

68. Dalton, H. G., *Demarara.*—Proprietor.
Cotton spun by the Indians; walking-stick of letter-wood.

69. Hayley, W., *Demarara.*—Proprietor.
Fans and war-clubs.

70. Greene, H. M., *Demarara.*—Proprietor.
A hammock.

71. Gemmell, M. C., *Demarara.*—Proprietor.
Queu.

72. Ries, B., *Demarara.*—Proprietor.
Walking-sticks, made of the Tooroo and Acuyuri palm.

FRANCE.

73. Theodon, Jr., & Requidat, *Paris.*—Manufacturers.
Canes; riding and driving whips, in whalebone, ivory, and wood, mounted in silver and gold; tortoise-shell baskets.

74. Alexandre, *Paris.*—Manufacturer.
Richly ornamented fans in mother-of-pearl.

[The manufacture of fans, in Paris, is a very extensive branch of industry, supplying all civilized nations with these useful and ornamental articles. Fans were known in the East from remote ages, and were introduced into Western Europe about the time of the Crusaders; in the sixteenth century, they came into general use, being generally made from peacock or ostrich feathers, fixed in a solid handle. In the time of Louis XIV., the folding-fan came into use, having been introduced from China by the Jesuits.

Paris fans are made of all prices, from one cent to five thousand dollars, one having been made of the latter value for the Emperor of Morocco. The chief parts of a fan are the *handle*, the *brins*, the *panaches*, the *ends*, and the *leaf*. The *handle* is the part where the fan is hinged together, and is made of ivory, wood, or any hard material. The *brins* are the radiating sticks, from twelve to twenty-four in number, and about four inches long; the *ends* are the elastic pieces which connect the brins with the handle; the *panaches* are the two outermost brins, wider and stronger, for the protection of the rest. The *leaf* is the surface of the fan, cut in the shape of the segment of a circle; it is made of paper, vellum, parchment, satin, gauze, or crape; it is the decoration of the leaf which makes the costliness of fans.]

75. Viel, *Paris.*—Manufacturer.
A variety of canes.

76. George, *Paris.*—Manufacturer.
A variety of fine brushes.

77. Le Blond, J. D., *Paris.*—Manufacturer.
A mannikin, of India-rubber, and all its accessories, for the use of artists and sculptors.

78. Gerard, *Tours, Indre et Loire.*—Manufacturer.
Wicker-baskets and other articles.

THE GERMAN STATES.

79. Probst, *Nuremberg, Bavaria.*—Manufacturer.
Specimens of combs, in ivory, tortoise-shell, and horn; hair-brushes.

80. Heckmann, B., *Nuremberg.*—Manufacturer.
Ivory brooches, paper-cutters, and fancy articles.

81. Heckel, William, *Memmingen, Bavaria.*—Manufacturer.
Specimens of bone buttons, rings, and dominoes.

82. Berger, *Nuremberg.*—Manufacturer.
Combs of various descriptions.

83. Behr, G. J., *Nuremberg.*—Manufacturer.
Combs, and various fancy articles, in ivory, tortoise-shell, and wood.

84. Weiss, *Nuremberg.*—Manufacturer.
Various articles made of mother-of-pearl.

85. Kleivino, J. A., *Nuremberg.*—Manufacturer.
A variety of needle-cases, and other articles, turned in bone, plain and colored.

86. Herbst, K. H., *Nuremberg.*—Manufacturer.
Salad and other spoons, of buffalo-horn.

87. Kern, John G., *Geringswalde, Saxony.*—Manufacturer.
A variety of articles manufactured in horn.

88. Lang, G. (Heirs), *Oberamergau, Wurtemberg.*—Manufacturer.
Various articles carved in wood.

89. Hanke, Emil, *Brieg, Prussian Silesia.*—Manufacturer.
Articles carved in ivory.

90. Friedrich, J. H., *Darmstadt, Hesse Darmstadt.*—Manufacturer.
Ivory drinking-cups, and other articles.

90A. Ziener, C., *Nuremberg.*—Manufacturer.
Specimens of ivory carvings.

90B. Bosshadt, H., *Nuremberg.*—Manufacturer.
Various articles carved in ivory and stag-horn.

90C. Hackman, E., *Nuremberg.*—Manufacturer.
A collection of fancy articles carved in wood.

91. Karcher & Haas, *Carlsruhe, Baden.*—Manufacturers.
A variety of crucifixes in wood.

92. Sauer, *Nuremberg.*—Manufacturer.
Brushes of various descriptions.

93. Rogler, Erlangen, *Bavaria.*—Manufacturer.
Specimens of brushes.

94. Meuschke, J. C., & Son, *Attenburg, Saxony.*—Manufacturers.
Specimens of paint, foot, clothes, and hair brushes.

95. Hausmer, Carl, *Nuremberg.*—Manufacturer.
Samples of tooth-brushes.

96. Heeren, O. G., *Bremen.*—Manufacturer.
Specimens of bristles for brushes.

97. Dietz, T. P., *Nuremberg.*—Manufacturer.
Specimens of brushes of various descriptions.

98. Gonnermann, Brothers, *Nuremberg.*—Manufacturers.
Artists' pencils and painting-brushes, of various descriptions.

99. Muller, J. H., *Bremen.*—Manufacturer.
Shoe and hand brushes, and mats.

100. Lehmann, B., *Leipsic.*—Manufacturer.
Carvings in ivory.

101. Ebert, Frederic, *Ansbach, Bavaria.*—Manufacturer.
Articles in mosaic straw.

102. Reichel, H. H., *Dippoldiswalde, Saxony.*—Manufacturer.
Straw braid for hats and bonnets.

103. Steinich, C., *Maxen, Saxony.*—Manufacturer.
Straw goods; hats, mats, and baskets.

104. Weppler, C. L., *Heilbronn, Wurtemberg.*—Manufacturer.
Specimens of articles in straw mosaic work.

105. Lincke, Frederic, & Co., *Dresden, Saxony.*—Manufacturers.
Straw bonnets and artificial flowers.

106. Wehnert, C., *Leipsic.*—Manufacturer.
Straw bonnets for dolls.

107. Robaitz, R., *Gotha, Saxe-Gotha.*—Manufacturer.
Fancy boxes and other articles, in wood and mosaic work.

108. Kohler, F. B., *Leipsic.*—Manufacturer.
An assortment of basket-ware.

109. Simon, W., *Hilburghausen, Saxe-Gotha.*—Manufacturer.
An assortment of baskets.

110. Fellgiebel & Co., *Shoenburg, Prussian Silesia.*—Manufacturer.
Fancy boxes of various descriptions.

111. Zinn, Baruch, *Redwitz, Bavaria.*—Manufacturer.
Fancy willow baskets.

112. Liesk, Adolph, *Berlin.*—Manufacturer.
Wood and leather walking-sticks.

113. Meyer, J. Z., *Bremen.*—Manufacturer.
Basket-ware, cane-chairs, cradles, flower-stands.

114. Fabian, C. G., *near Breslau, Prussia.*—Manufacturer.
"Pine-needle wool," for upholstery, intended as a protection from moths, and for wadding; wadded blankets, made of "pine-wood wool."

[Obtained by treating the pine leaves with a strong boiling solution of carbonate of soda.]

THE AUSTRIAN EMPIRE.

115. Schaffler, Joseph, *Schwatz, Tyrol.*—Manufacturer.
Horn combs of various descriptions.

116. Raffelsperger, F., *Vienna.*—Manufacturer.
Samples of horn buttons.

117. Benk, John, *Vienna.*—Manufacturer.
Various figures and objects in carved wood.

THE ITALIAN STATES.

118. Antonio, Father Carlo, *Genoa, Sardinia.*—Manufacturer.
Beautiful specimens of ivory carving; crucifixes; the Virgin and child.

119. Garassino, V., *Savona, Sardinia.*—Manufacturer.
Two ivory crucifixes. [Figured on page 166 of Record.]

120. Ramella, G., *Turin.*—Manufacturer.
Two ivory crucifixes.

121. Vallé, S., *Genoa.*—Manufacturer.
Specimen of ivory carving—"Italy weeping over the tomb of the martyrs of 1848."

122. Pepino, Borgs S., *Dalmazzo, near Turin.*
Three vases of flowers carved in wood.

123. Galliena, G., *Turin.*—Manufacturer.
A bracket sculptured in wood, representing the chase of the wolf. [For figure, see the Record, page 144.]

124. Torsegno, G., *Genoa.*—Manufacturer.
Two vases in richly carved wood, gilded externally, and lined with copper.

125. Bosi, Enrico, *Florence, Tuscany.*—Manufacturer.
Two caskets for jewels, made of iron-wood, and ornamented in Florentine mosaic.

126. Brilla, A., *Savona, Sardinia.*—Manufacturer.
An ivory crucifix.

127. Garrassino, T., *Savona, Sardinia.*—Manufacturer.
A picture in wood-mosaic. [For figure, see the Record, page 166.]

128. Ciaudo, Giuseppe, *Nice, Sardinia.*—Manufacturer.
A picture in wood-mosaic; twisted canes of orange-wood.

129. Benelli, G., *Florence.*—Manufacturer.
Miniature frame of carved box-wood.

130. Dupré (Widow) & Son, *Turin.*—Manufacturers.
Jewel-cases and fancy boxes, in shell, morocco, and various kinds of wood.

131. Fino, Giovanni, *Turin.*—Manufacturer.
Specimens of pencils and brushes of all descriptions.

132. Schmidt, F. G., *Genoa.*—Manufacturer.
Specimens of braids of chips for hats.

133. Tamassia & Bazzoli, *Mirandola, Modena.*—Manufacturers.
Braids of fine willow chips for hats.

SWITZERLAND.

134. Hurter & Buholzer, *Lucerne.*—Manufacturers.
Specimens of horse-hair, double and single tress.

135. Kehrli, Brothers, & Dauler, *Giessbach, Canton Berne.*—Manufacturers.
Groups of figures, cottages, cups, bowls, and other objects, carved in white and red wood; various objects in painted wood. [For figures, see the Record, page 125.]

136. Baumann, A., *Brientz, Canton Berne.*—Manufacturer.
Glove-boxes; vases of flowers, and fancy boxes, richly carved in white wood. [For figures, see the Record, page 125.]

137. Wegelin, D., *Thun, Canton Berne.*—Manufacturer.
Fancy boxes, and other articles, in carved and painted wood.

138. Wirtz, J., *Berne.*—Manufacturer.
Fancy boxes, fans, &c., in carved and painted wood.

139. Kehrli, Brothers, *Brientz, Berne.*—Manufacturers.
Tables, Swiss cottage, group of chamois, and various other objects, in carved wood.

140. Fluck, Joseph, *Brientz, Berne.*—Manufacturer.
A richly carved cup, in wood.

141. Rey-Gaillard, *Brientz?*—Manufacturer.
A play-box, in painted wood.

142. Geissmann & Co., *Wohlen, Canton Argovie.*—Manufacturers.
Various kinds of straw trimmings; mixed hair and straw trimmings, braids, laces, and fancy articles; straw flowers; embroideries in straw, upon blondes.

143. Sulzberger, Akermann & Co., *Meisterschwanden, Argovie.*—Manufacturers.
Specimens of cabas, cigar-cases, tassels, and straw ornaments; straw ropes; bleached straw.

144. Isler & Otto, *Willdeg, near Aarau, Argovie.*—Manufacturers.
A variety of rich straw and hair braids, tresses, trimmings, and embroideries, upon blondes, lace, &c.

145. Meyer, J. L, & Brothers, *Wohlen, Argovie.*—Manufacturers.
Samples of twisted or braided straws, cigar-cases, tassels, &c.

146. Claras, A., *Fribourg.*—Manufacturer.
Straw trimmings and bonnets.

BELGIUM.

147. Somzé-Malry, H., *Liège.*—Manufacturer.
Brushes for military, railway, and other purposes.

148. Malaise, B., Jr., *Liège.*—Manufacturer.
Brushes and broom heads of various kinds.

149. Dejonghe, *Brussels.*—Manufacturer.
Canes of carved wood.

THE NETHERLANDS.

150. Hatt, J. E., *Leyst.*—Manufacturer.
A chandelier of twenty-four lights, and various smaller articles carved in buck horn and ivory.

151. Dirks, H. J., *Dordrecht.*—Manufacturer.
Brushes of various descriptions.

152. Post & Wendt, *Waddingsveen.*—Manufacturers.
Whalebone, whips, and walking-canes.

153. Bresser, Brothers, *Tilburg.*—Manufacturers.
Handbows and arrows for target practice.

154. Clerck, H. de, *Haarlem.*—Manufacturer.
Vulcanized India-rubber tubes, rings, carriage-bearing springs, door-springs, acoustic tubes, bands, &c.

155. Beuker, G. A., *Rotterdam.*—Manufacturer.
Pheasant-house of East India bamboo.

SWEDEN AND NORWAY.

156. Thesen, J. P., *Christiana, Norway.*—Proprietor.
Various objects carved in wood, by the Norwegian peasantry; comprising a bucket, coal-tub and cover, tobacco and other boxes, and jugs.

157. Thanlow, Dr. H. A., *Modum, Norway.*—Proprietor.
Reindeer antlers and snow-shoes.

SECTION III. CLASS XXIX.

MISCELLANEOUS MANUFACTURES, PERFUMERY, CONFECTIONERY, TOYS, TAXIDERMY, ETC.

THE present class contains all those miscellaneous manufactures which could not be arranged under any other class. Perfumery and toilet soaps were largely exhibited, and are perhaps the most important articles mentioned here. French manufacturers exhibited artificial flowers, whose beauty was inferior only to the originals of the fields and gardens. In the American department were specimens of stuffed birds, &c., highly creditable to the accomplished taxidermist. The German manufacturers sent an infinite variety of toys and other small wares. The specimens of native manufactures from the Indians of Guiana are numerous and interesting.

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1. JOHNSON, JONATHAN T., *New York City.*—Manufacturer.
Specimens of soaps, in plain and fancy styles; fine perfumery, and extracts; orris tooth soap.

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2. THOMPSON, JOHN, *Williamsburgh, New York.*—Manufacturer.
Toilet and fancy soaps; transparent soaps for the toilet and washing purposes.

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3. COLGATE, WILLIAM, *New York City.*—Manufacturer.
Specimens of fancy soaps and fine starch.

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4. MICHAEL, LOUIS, *New York City.*—Manufacturer.
Fancy soaps, pommades, extracts, toilet vinegars, and other articles of perfumery.

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5. JOHNSON, WILLIAM, *New York City.*—Manufacturer.
Specimens of transparent soaps, shaving soap, and starch-polish.

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6. JONES, STEPHEN W., *New York City.*—Manufacturer.
A pyramid of fancy soap.

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7. WILLIAMS, C. F., *New York City.*—Manufacturer.
Varieties of soap.

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8. PAYSON, IRA F., *Stapleton, New York.*—Manufacturer.
Specimens of a new and patent variety of soap.

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9. SCHELLHAAS, JUSTIN, *New York City.*—Manufacturer.
Various specimens of fancy soaps and perfumery.

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10. BAZIN, XAVIER, *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of fine toilet soaps, and various choice articles of perfumery.

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11. TAYLOR, H. P. & W. C., *Philadelphia, Pennsylvania.*—Manufacturers.
A variety of transparent and fancy soaps; soap window.

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12. WILLIAMS, JAMES B., & Co., *Glastonbury, Connecticut.*—Manufacturers.
Fancy soaps; toilet and shaving cream; liquid blueing for the laundry; paste and liquid blacking.

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13. BECK & Co., *Boston, Massachusetts.*—Manufacturers.
Babbitt's superior toilet soaps, shaving-creams, verbena water, and other perfumery.

[The distinguished chemist, Liebig, has remarked, that "the quantity of soap consumed by a nation would be no inaccurate measure whereby to estimate its wealth and civilization." Soap is not older than the Christian era, the soap mentioned in the Old Testament having been merely an alkali. Pliny is the first writer who gives an authentic account of soap, saying that it is made of tallow and ashes; stating, at the same time, that it was particularly well prepared in Germany, and that its chief use was to dye the hair yellow.

The materials used in making soaps are alkalies, on the one hand; and, on the other, animal and vegetable fats and oils, and rosin. Fats may be resolved into two proximate fatty substances, *olein*, fluid at common temperatures, and *stearin*, a solid; what is usually called stearin, is a mixture of the stearin of the chemist and margarin, differing in their relative proportions according to the kind of fat; thus tallow contains chiefly stearin, while lard and olive oil consist chiefly of margarin. Stearin, margarin, and olein, are compounds of stearic, margaric, and oleic acids, with oxyd of glyceryl. If olein is boiled with a solution of potash or soda, oleates of potash or soda are formed, which are what we call *soaps*. Similar soaps are formed by the other fatty acids.

Fine white soaps are generally made from olive oil and soda-ley, boiled together; perfumes are added, and coloring matters are stirred in, before hardening, to give a mottled appearance. Spanish soap is marbled by stirring in a solution of sulphate of iron, which is decomposed by the soap into the black oxyd, in streaks and patches; the oxygen of the air converts this into the red oxyd. Common domestic soaps are made chiefly from tallow and soda; soft soaps are made with potash, instead of soda, and with fish or vegetable oils; yellow soap is made by adding about one-third or one-fourth of rosin to the tallow and alkali, toward the end of the process, a little palm oil being often added, to correct the odor of the resin, and to brighten the color. Soap is soluble in pure water, and in alcohol; in the latter is formed, on evaporation, a translucent or "transparent" soap. Soap made from cocoa-nut oil differs from ordinary soap, in being soluble in salt water, which renders it valuable as a *marine* soap. *Floating* soap, so called, is made by melting common soap with water, and beating it into a thick froth, which occupies twice the original bulk. *Silicated* soap is made by combining silicate of soda (obtained by boiling powdered flint in a close vessel, under strong pressure, with caustic soda) with hard soap, in the melted state; this has great detergent properties, but feels gritty to the hand—sand, mixed with soap, possesses the same properties.

The cleansing property of soap is usually considered to depend on the amount of alkali which it contains; pure alkali would injure the hands and the fabric, but by combination with the fatty acids its action is rendered milder, without destroying its property of combining with impurities, and especially with fatty matters. Soap also acts by dissolving substances insoluble in water; it also has a mechanical effect, by increasing the cohesion of water, so as to form a lather, and by carrying off insoluble particles of dirt, by the frictional action of the frothy water.

It is to the researches of Chevreul that the true theory of the formation and nature of soaps is due.]

14. Cleveland, W. L., *Charleston, South Carolina.*—Manufacturer.
Specimens of superior cologne water.

15. Barnes, D. S., *New York City.*—Manufacturer.
Specimens of Lyon's extracts, colognes, Kathairon, bandoline, and other articles of perfumery.

16. Whitely, N., *New York City.*—Patentee and Manufacturer.
Patent perfumed oriental crystal, or "spirit of the flowers."

17. Lindmark, John, *New York City.*—Manufacturer.
Specimens of cologne water and shaving-cream.

18. Rice & Smith, *New York City.*—Manufacturers.
Specimens of perfumery and fancy articles.

19. Ashard, Brothers, *New York City.*—Manufacturers.
A model of the Crystal Palace, with specimens of perfumery.

20. Phalon, Edward, *New York City.*—Manufacturer.
Cologne fountain; choice extracts, essences, and chemical preparations; toilet-soaps of various kinds.

[A good perfume should leave no resinous residue on evaporation, and the ingredients should be combined so harmoniously that no particular one should be perceptible; and the more the materials resemble each other, the easier is it to effect this end. For this reason, well prepared eau de cologne may be considered the perfection of perfumery; the essential oils of lemon, orange, and citron, of which it is chiefly composed, approximating so nearly in their character as to produce a single impression on the organ of smell. Some of the most esteemed modern scents are made by chemical means, from materials which are generally considered any thing but pleasant. The perfume of flowers often consists of oils and ethers, which the chemist can make in his laboratory from the most unpromising articles.

The oil of *wintergreen*, much used in perfumery, and originally obtained from the *Gualtheria procumbens*, is now made from *salicylic acid*, obtained from the willow, and *piroxylic* spirit procured in the distillation of wood. In the rectification of brandy, whisky, and crude spirit, there comes over with the last portions an oil, of a burning taste and pungent odor, called *fusel oil*, or *amylicalcohol*; this oil, distilled with sulphuric acid and acetate of potash, forms a spirituous solution of acetate of oxyd of amyl, which, when sufficiently diluted with spirit, forms the artificial *oil of pears*, used in perfumery, and in the so-called jargonelle-pear drops. The *oil of apples* is obtained by distilling the same fusel oil with sulphuric acid and bichromate of potash. The *oil of pine-apples* is obtained by boiling *butyric acid* (the product of the fermentation of sugar with putrid cheese, or the making of soap with fresh butter and potash) with strong spirit, and a small quantity of concentrated sulphuric acid. *Oil of cognac*, used to impart the flavor of cognac to common brandy, is only fusel oil diluted with alcohol; thus a substance carefully removed from brandy, on account of its offensive flavor, is reintroduced, in another form, to produce an agreeable flavor. The *oil of bitter almonds* is made by the action of nitric acid on the fetid oil of gas-tar.

Deville (Comptes Rendus. 1849), from the action of hydrochloric acid, or oil of turpentine, produces a species of camphor, which, treated with potassium, yields an essential oil, identical in odor, boiling point, density, and composition, with *oil of lemons*.

According to Wagner, *oil of rue* is evolved by cod-liver oil, when acted on by sulphuric acid, and the resulting purplish mass saturated with an alkali or alkaline earth.

According to Wöhler, the odor of *castor* is due to carbolic acid, which may also be obtained among the products of coal-tar.]

21. Cristiani, Richard S., *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of fine perfumery.

22. Nesbert, Thomas B., *Natchez, Mississippi.*—Manufacturer.
Specimens of perfumery.

23. Clirehugh, V., *New York City.*—Manufacturer.
Tricopherous, or patent medicated compound for the hair.

24. Van Deusen, George, *New York City.*—Manufacturer.
Specimens of wahpene, an Indian specific for the improvement of the growth of the hair.

25. Brown, Mrs. George N. H., *New York City.*—Inventor and Manufacturer.
Nonpareil hair-lustral, an odoriferous creamy liquid, for cleansing and improving the hair.

26. Ballard, O. M., *New York City.*—Manufacturer.
Liquid hair-dye, imparting a permanent color of any shade, from a light-brown to a jet-black; it is free from caustic properties.

27. Jones, John A., *Baltimore, Maryland.*—Manufacturer.
Hair-dyes, with specimens of hair dyed; hair-restorative, and hair oils; tooth-powders.

28. Cummings, John A., *Boston, Massachusetts.*—Manufacturer.
Premium dental toilet sets, dentifrice, and tooth-wash.

29. Payson & Thurston, *Stapleton, New York.*—Manufacturers.
Payson's tooth-powder.

30. Da Costa, R. B., *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of West Indian tincture for the gums.

31. Zerman, Francis, *Philadelphia, Pennsylvania.*—Manufacturer.
Specimens of an improved tooth-wash.

[Many of the popular dentifrices are absolutely injurious, and most of them not at all better than common soap. Good brown Windsor or Castile soap is the best dentifrice; it will not injure the enamel or other structures of the teeth, and will prevent or destroy the animal and vegetable parasites, which many people carry about with them unconsciously, lodged between the interstices of the teeth. In case of spongy or unhealthy gums, some vegetable astringent may be used with advantage, as powdered bark; charcoal, and mineral substances, should not be used.]

32. Lynch, Edwin, *Pawtucket, Rhode Island.*—Manufacturers.
Liquid blacking.

33. Mason, James S., & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Specimens of blacking, which, while it communicates a fine polish, preserves the leather, by the great amount of oil it contains. It is made with the finest ivory-black and fine lamp-black; the oils used are cod-liver, sperm, and neat's-foot. This manufactory was established in 1832; it now employs over one hundred persons.

34. Deventer, John Van, *New York City.*—Manufacturer.
Oil-paste blacking, and water-proof composition for leather.

35. Herring, Charles F., *Williamsburgh, New York.*—Manufacturer.
Specimens of blacking; moulding is prevented by the addition of a small quantity of asphaltum.

36. Rushton & Myers, *Philadelphia, Pennsylvania.*—Manufacturers.
Specimens of "magic blacking," tin blacking-boxes, &c.

[Blacking consists of a black coloring matter, generally bone-black, and substances which acquire a gloss by friction, such as sugar and oil. The usual way is to mix the bone-black with sperm oil; sugar or molasses, with a little vinegar, is then well stirred in; and then strong sulphuric acid is gradually added. The acid, acting on the salts of lime in the bone-black, produces sulphate of lime and a soluble acid phosphate; the sulphate forms a tenacious paste with the other ingredients, which can be spread very smoothly; the oil serves to render the leather pliable. This forms a liquid blacking; paste blacking contains less vinegar. According to Liebig, in Germany, blacking is made as follows: the bone-black is mixed with half its weight of molasses, and one-eighth of its weight of olive oil; to which are afterwards added one-eighth of its weight of hydrochloric acid, and one-fourth of its weight of strong sulphuric acid; mixed up, with water, to an unctuous paste.]

37. Austin, Amelia Ann, *New York City.*—Manufacturer.
Specimens of flowers in wax.

38. Guilleaume & Korn, *New York City.*—Manufacturers.
Specimens of artificial leaves and flowers.

39. Vanskilline, Mrs. Theodore, *New York City.*—Manufacturer.
Specimens of paper flowers, exhibited in a frame of pressed leather.

40. Civatte, Madame, *New York City.*—Manufacturer.
Specimens of artificial flowers.

41. Sloat, Miss Jane S. B., *Piermont, New York.*—Manufacturer.
A basket of wax-flowers.

42. Crocker, Elnora T., *Syracuse, New York.*—Manufacturer.
Specimens of wax flowers and fruits.

43. Harris, Mrs. S. J., *Brooklyn, New York.*—Manufacturer.
A basket of wax-fruit.

44. Brunswick, Hyman, *New York City.*—Manufacturer.
Figures and other objects in wax composition.

45. Hickox, Mrs. Wesley, *Syracuse, New York.*—Manufacturer.
A tableau of fine flowers, fruit, and vegetables, in wax.

46. Rogers, Henry S., *New York City.*—Proprietor.
A great variety of wax and rag dolls.

47. Lane, John S., *New York City.*—Manufacturer.
Chains and other fancy carvings in wood, done with a penknife.

48. Ross, Mrs. Catharine, *Cincinnati, Ohio.*—Manufacturer.
A shell monument to the memory of Washington.

49. Richmond, Cyrus, *Halifax, Massachusetts.*—Manufacturer.
Chain carved out of a single piece of wood.

50. Wilson, Peter, *Versailles, New York.*—Proprietor.
Fancy articles manufactured by the Cayuga Indians.

51. Judson, Mary A., *Brooklyn, New York.*—Manufacturer.
A fancy card-case in worked paper.

52. Reed, Mrs. Sarah Ann, *New York City.*—Manufacturer.
Various ornamental objects, wrought in hair, chenille, shells, wax, beads, and moss.

53. Cochran, Miss M. A., *Brooklyn, New York.*—Manufacturer.
Crystallized grasses.

[The grasses are dipped in solutions, variously colored, of alum, and other salts, which are allowed to crystallize upon them.]

54. Walton, Mrs. Ezekiel P., *Montpelier, Vermont.*—Manufacturer.
A head of Washington in shell-work.

55. Wilt, Benjamin, *New York City.*—Manufacturer.
Ornamental fruit-cakes.

56. Maillard, H., & Co., *New York City.*—Manufacturers.
Specimens of fine ornamental confectionery.

57. Struelens, Nazaire, & Co., *New York City.*—Manufacturers.
Specimens of fine French confectionery, and fancy chocolates; birds, butterflies, and other sugar ornaments.

58. Kilian, K., *New York City.*—Manufacturer.
The "Last shot of the Prairie-hunter," in sugar paste.

59. Mendes & Martin, *New York City.*—Manufacturers.
Steam-made confectionery and fancy chocolates.

60. Fistie, H. N., *New York City.*—Manufacturer.
A variety of ornamental confectionery.

61. Urian, John, & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Specimens of confectionery.

62. Chandler, George, *New York City.*—Manufacturer.
Specimens of jujube paste; powder-boxes and puffs.

63. Smith, John T. L., *New York City.*—Manufacturer.
Pocket, and larger cases of homœopathic medicine; specimens of sugar of milk, and other articles used in this practice.

64. Tuttle, George W., *New York City.*—Manufacturer.
Swing and baby-jumper, dressed dolls, portfolios, necessaries, newspaper-files, &c.

65. Rogers, W. S., *New York City.*—Manufacturer.
Velocipedes, baby-houses, dressed dolls, and fancy articles.

66. Holbeaton, John W., *New York City.*—Manufacturer.
Japanned and painted tin toys.

67. Pia, Brothers, *New York City.*—Manufacturers.
A variety of pewter toys.

68. Wheeler, E. S., & Co., *New York City.*—Manufacturers and Agents.
A variety of buttons.

69. Bate, T. & T. H., *New York City.*—Manufacturers.
Needles, fish-hooks, and all kinds of fishing-tackle.

70. Conroy, J. & J. C., *New York City.*—Manufacturers.
An assortment of fishing-tackle.

71. Meeks & Milan, *Frankfort, Kentucky.*—Manufacturers.
A new fishing-reel.

72. Crook, J. B., & Co., *New York City.*—Manufacturers.
A general assortment of fishing-tackle and artificial flies.

73. Rose, William E., *New York City.*—Manufacturer.
Canes in various styles, mounted in gold and silver.

74. Smith, Isaac, Sons, & Co., *New York City.*—Manufacturers.
A variety of umbrellas and parasols.

75. Wacker, F. & C., *New York City.*—Manufacturers.
Various styles of fancy walking-canes.

76. Woods, James, *New York City.*—Manufacturer.
Silk umbrellas and parasols.

77. Smith, John J., *New York City.*—Manufacturer.
Umbrellas, parasols, and walking-sticks, of all descriptions.

78. Schneider, Peter, *New York City.*—Manufacturer.
A variety of walking-canes.

79. Lee, E., *Tampa Bay, Florida.*—Manufacturer.
Canes made of the wood of the orange-tree.

[There is scarcely a wood which has not been made into canes; the woods usually employed, however, are the hickory, the crab, the maple, the oak, beech, orange, cherry, and the thorn; the supple-jacks, and similar West Indian sticks; the ratans and bamboos, of the East Indies. Various animal substances, as whalebone, horns, ivory, and bone, are made into canes.

The umbrella and parasol were first used as protections against the sun. The parasol was introduced into Europe, from China, about the middle of the seventeenth century; its use has now become indispensable to the ladies, even on the shady side of the street; by arranging the top at right angles to the stick, it protects not only from the sun, but also from the gaze of staring impudence, to say nothing of its efficacy as a weapon for putting out people's eyes.

The first umbrellas were exceedingly cumbersome, being made from oiled silk and cloth, and when wet were very difficult to open; silk, gingham, and alpaca, are now substituted, rendering the heavy sticks no longer necessary. The sticks are usually made of ratan (dyed black by logwood and sulphate of iron), of whalebone, and more recently of steel.]

80. Pearson & Sallada, *Philadelphia, Pennsylvania.*—Manufacturers.
Specimens of riding and driving whips.

81. Saunders, George, & Son, *New York City.*—Manufacturers.
Specimens of fine razor-strops.

82. Zuern & Rauftle, *New York City.*—Manufacturers.
Fine morocco jewel-cases, pocket-books, portable writing-desks, work-baskets, reticules, and articles in fancy leather.

83. Dunham, Edoar A., *New York City.*—Manufacturer.
A work-box.

84. Deno, Adolph, *New York City.*—Manufacturer.
A lady's work-box.

85. Matthews & Hunt, *New York City.*—Manufacturers.
A new style of carpet-bags.

86. Schorbn, Joseph, *New York City.*—Manufacturer.
Porte-monnaies, reticules, work-boxes, in leather, steel, pearl, and ivory.

87. Saunders, William, *New York City.*—Manufacturer.
Traveling dressing-cases, razor-strops, &c.

88. Seele, John P., *New York City.*—Manufacturer.
Morocco and velvet cases for jewelry.

89. Webster, Nelson, *Plainfield, New Jersey.*—Manufacturer.
White and fancy-colored feather fans.

90. Beer & Co., *New York City.*—Manufacturers.
Porte-monnaies and cigar-cases, of leather and mother-of-pearl.

91. Menkel, Anthony, *New York City.*—Manufacturer.
Porte-monnaies, portfolios, and cigar-cases.

92. Rand, Jasper R., *Westfield, Massachusetts.*—Manufacturer.
Whips and whip-thongs; harness-cords, for lines and traces.

93. Blair, George A., *Smyrna, Tennessee.*—Manufacturer.
Specimens of fans and fly-brushes, of peacock feathers.

94. White, Daniel, *New York City.*—Manufacturer.
Glazed and twisted tobacco-pipes; pipe-heads, of various descriptions.

95. Scheiffele, G. S., *New York City.*—Importer.
An assortment of meerschaum pipes, amber mouth-pieces, and mechanical toys.

[*Meerschaum* (foam-of-the-sea), or magnesite, is a hydrated silicate of magnesia; silicates of iron and alumina are sometimes contained in it, which affect its color, which ought to be white. It is tolerably soft, easily indented by the finger-nail, and

when wet, easily cut with the knife; its fracture is earthy, rarely conchoidal; some kinds will sink in water, others will float. It is met with in various localities, as Spain, Greece, and Moravia, but most of it is brought from Asia Minor. It is generally pressed into moulds on the spot (into blocks), dried by heat, boiled in milk, and afterwards rudely polished with soft leather; whence they are carried to Constantinople. They are bought by German merchants, who, for the most part, send them to Vienna, where they are soaked in water, and turned in lathes in various forms. Previous, however, to being made into pipe-bowls, it is soaked in liquefied unguent of wax, oil, and fats; the absorption of these substances causes the colors assumed by the meerschaum after being smoked, by combining with the products from the burning tobacco; the colors thus produced are highly prized by the connoisseur in these articles. It is polished by its own shavings, and by being rubbed with white wax. The parings are reduced to powder, boiled in water, and moulded into blocks, from which the "massa" pipe-bowls are made; it is often very difficult to detect these from the genuine pipes before using them.

Amber, from which the mouth-pieces of these pipes are usually made, is a resinous exudation from an extinct species of coniferous tree, called by Göppert *Pinites succinifer*. Most of it is obtained from the shores of the Baltic, from Königsberg to Dantzic; it is also found on the coasts of Denmark and Sweden, in Poland, Russia, Switzerland, France, and England; in Asia; in this country, in the green sand formation of New Jersey, and in Martha's Vineyard. With it, are found fragments of lignite, and it frequently contains insects of extinct species imbedded in its substance; it is also marked with the impressions of branches and bark. It is sometimes thrown up in great quantities after storms. It contains a volatile oil, two resins (soluble in alcohol and ether), *succinic acid*, and an insoluble bituminous substance.]

96. Bell, John G., *New York City.*—Taxidermist.
Specimens of preserved quadrupeds and birds.

97. Bode, John L., *New York City.*—Taxidermist.
Stuffed bear, stuffed birds, and other animals.

98. Haring, James L., *Piermont, New York.*—Taxidermist.
A case of stuffed birds.

99. Morris, William, *Brooklyn, New York.*—Proprietor.
Two stuffed dogs of the pure terrier species.

100. Hurst, James A., *Albany, New York.*—Taxidermist.
Preserved ourang-outang and green monkey; panthers, male and female; albino and mottled deer; owls, game-birds of various countries; fish, and other animals.

[The art of taxidermy is of great importance to the student of Natural History; the great collections of the British Museum, and the Jardin des Plantes—and, in this country, of the Academy of Natural Sciences at Philadelphia, and smaller ones at Boston, Albany, and other cities—show, at once, the perfection of the art and its importance.

By means of antiseptic applications, especially a soap containing arsenic and camphor, preparations of skins of quadrupeds, birds, &c., are preserved free from the attacks of insects, if properly cared for, for an indefinite period of time. The habits of the animals represented are carefully studied by the taxidermist, in order to present, besides the form, the attitude, and the life-like attributes of the particular specimen. The worst enemies of the naturalist and taxidermist, are two species of beetles, the *Dermestes* and the *Anthrœnus*, which, in their larva state, in the form of worms, covered with hairs, commit great ravages wherever there is any animal substance; the skins of birds and animals are quite destroyed before their attacks are suspected; the ligaments of small skeletons, hoofs, and horns, soon show the presence of these animals, by the dust which falls from their gnawings; whole collections of insects are reduced to dust-heaps, in spite of camphor, tobacco, and similar substances. The only way to kill them is by baking the specimens which contain their eggs above 160° Fahrenheit, which will coagulate the albumen, and destroy them; to prevent their attacks, skins and ligaments should be thoroughly poisoned with arsenic, and insects should be hermetically sealed.]

101. Somerville, J. McAlpine, *Philadelphia, Pennsylvania.*—Producer.
Marine algæ, or preparations of seaweed.

102. Wayne, Bailey & Co., *Cincinnati, Ohio.*—Inventors and Manufacturers.
Zinc washboards.

103. Cleveland & Co., *New York City.*—Proprietors.
Bales of merchandize, exhibited to show the manner of packing goods for the California and South America markets.

104. Thomas, T. Frederick, *New York City.*—Proprietor.
Self-adjusting door-alarm.

105. Hyde, S. B., *New York City.*—Publisher.
Person's pocket-medal calendar for 1854.

106. Taylor, Edward G., *New York City.*—Manufacturer.
Specimens of daguerreotype cases and frames.

107. Morton, Thomas, & Brother, *New York City.*—Manufacturers.
Steel clasps, locks, and frames, for porte-monnaies, portfolios, souvenirs, and pocket-books.

108. Bulkley, R., *New York City.*—Proprietor.
Patent metallic life-preservers.

109. Maxheimer, J., & Brothers, *New York City.*—Manufacturers.
Fancy wire bird-cages.

110. Moran, Marcius, *New York City.*—Manufacturer.
Checker and backgammon board, highly finished; the work of a boy.

111. Waterman, Charles, *West Meriden, Connecticut.*—Manufacturer.
Specimens of the mechanical "sewing-bird;" new patent-spring tape-measure.

112. Smith & Butler, *New York City.*—Manufacturers.
Patent letter and invoice file.

113. Brush, Anna M., *New York City.*—Manufacturer.
Lemon-tray, card-basket, &c.

114. Walter & Winterbottom, *Philadelphia, Pennsylvania.*—Manufacturers.
Specimens of white crayons.

115. Campbell, Robert M., *East Cambridge, Massachusetts.*—Inventor and Manufacturer.
Pure crystal cement for repairing broken glass, china, &c.

116. Widdows, F., *New York City.*—Inventor and Manufacturer.
Specimens of the "Metropolitan" crystal cement, for mending glass, china, &c. It is durable, and transparent, and resists the action of hot water.

117. Whitmore, George W., *New York City.*—Manufacturer.
Specimens of sand-paper of various qualities.

118. Parsons, William B., *New York City.*—Manufacturer.
Specimens of sand and emery papers.

119. Smith, D. M., *Springfield, Vermont.*—Manufacturer.
Specimens of clothes-pins.

120. Bissell, E. M., *Orford, New Hampshire.*—Producer.
Specimens of packages of flower-seeds.

121. Wood, C. B., *New York City.*—Proprietor.
Fish and craw-fish, without eyes, from the Mammoth Cave, Kentucky.

[The Mammoth Cave, of Kentucky, has been formed by the action of running water on a soluble limestone rock. The animals of this cave are destitute of eyes, or, at any rate, of eyes which see. There are two species of fish—one, colorless and eyeless; from the fact of its being viviparous, from the character of the scales, and the form and structure of the head, Professor Agassiz is inclined to consider it an aberrant type of the family of *Cyprinodonts*—a second species is not colorless, like the first, and has external eyes, which, however, have no powers of vision. There is also a rat, of a bluish color, with white feet, belly, and throat, and a very soft fur; it has large black eyes, without iris, which are entirely blind. The craw-fish are also colorless and blind; the peduncles of eyes exist, but there are no visible facets at the extremities as in common species. Colorless crickets, two small eyeless white species of spiders, a minute shrimp, and two blind beetles, are also found.

The primitive condition of these eyeless animals, is a most interesting and important, though extremely difficult subject of investigation; by settling this question, would be determined the primitive conditions and localities of the present living races of animals. If it could be ascertained that these animals had organs of vision during the embryonic state, and gradually became blind, though exposed to circumstances which should favor the growth of their eyes, it would prove that they were created under circumstances in which they now live, within their present geographical limits, and with the structural peculiarities which they now present. If, on the other hand, they should gradually recover their vision, it would prove that they were created like others of their genera, and had been changed in this remarkable manner by surrounding physical circumstances. This question is of the utmost importance, for the solution of the great problem of the unity or diversity of origin of men and animals.]

122. Richard, Albert C., *New York City.*—Manufacturer.
Safety money-drawer, into which the purchaser sees the money dropped, and which is inaccessible to any one but the proprietor.

GREAT BRITAIN AND IRELAND.

123. Cleaver, Frederick S., *London.*—Manufacturer.
Honey, toilet, and other fancy soaps.

124. Gibbs, David & William, *London.*—Inventors and Manufacturers.
Hard, soft, and toilet soaps; Naples shaving-tablets, and medical soaps.

125. Taylor & Son, *Chelsea, London.*—Manufacturers.
A collection of soaps and perfumery.

126. Rimmel, Eugene, *London.*—Manufacturer.
Fountain of perfumed toilet-vinegar; scented winter boquets, perfumery, and soaps.

127. Rowland, A., & Sons, *London.*—Manufacturers.
Specimens of perfumery.

128. Low, Robert, Son, & Benbow, *London.*—Manufacturers.
Embossed Windsor and fancy soaps; perfumery; hair-brushes, in ivory, rosewood, and satin-wood.

[The production of soap in Great Britain, in 1850, amounted to more than 200 million pounds; of this quantity, over 12 millions were exported, and about 23 millions used by manufacturers, leaving nearly 170 million pounds, or 75,500 tons, to be consumed in domestic use, or about eight pounds to each person. The so-called "Windsor" soap is known in all countries, for its excellence, both as a washing and shaving soap.]

129. Stevens, William, *London.*—Designer and Proprietor.
Three cases of preserved flowers—two arranged botanically, and one ornamentally.

130. Harrison, Miss Margaret, *London.*—Manufacturer.
Specimens of wax flowers.

131. Sangster, William & J., *London.*—Patentees and Manufacturers.
Silk and alpacca umbrellas and parasols, of improved style.

132. Ainge & Aldred, *London.*—Manufacturers.
Fishing-rods and tackle; bows and arrows, and archery implements, richly carved.

133. Worrell, James, *Bath, England.*—Inventor and Manufacturer
Ladies' fancy-work and bridal baskets.

134. Glennon, Miss Elizabeth, *Dublin.*—Proprietor.
A case of preserved Irish game-birds.

135. Day, Miss Anna, *Dublin.*—Manufacturer.
Grotto and fancy baskets, made of Irish seaweeds and shells.

136. Brown, Charles, *Dublin.*—Manufacturer.
Irish clay pipes.

137. Graham, Lemon & Co., *Dublin.*—Manufacturers.
Comfits and lozenges made by steam.

BRITISH COLONIES.—CANADA.

138. Cochrane, Miss, *Quebec, Canada East.*—Manufacturer.
Specimens of wax fruit.

139. Duncan, Thomas, *Montreal, Canada East.*—Manufacturer.
Specimens of salmon and trout flies, and fishing-tackle.

140. Quebec Industrial Committee, *Quebec.*—Proprietor.
A money-purse, table-mats, knife-sheath, mink and muskrat skin bags; ornamented moose and caribou hoofs; bark-work and card-trays, baskets, cigar-cases, fan, watch-holders, and card-cases; prepared, manufactured, and ornamented with beads, by the Loretto Indians.

BRITISH COLONIES.—GUIANA.

141. Goodman, Stephen, *Demarara.*—Proprietor.
Skin of the American jaguar (*Felis onca*).

142. Greene, H. M., *Demarara.*—Proprietor.
Skin of the great ant-eater (*Myrmecophaga jubata*), and quills of the porcupine.

143. Brotherson, E. S., *Demarara.*—Proprietor.
A case of stuffed birds, toucans, tanagers, orioles, parrots, and other South American birds of brilliant plumage.

144. Cullen, John, *Demarara.*—Proprietor.
Nest of the maribunta, an insect of the genus *Polistes;* snout of the saw-fish (*Pristis antiquorum*).

145. Morison, Knox, & A. Livingston, *Demarara.*—Proprietors.
Isinglass, the dried swimming-bladder of the geelbrick, or gilbacker (*Silurus Purkerii*), a fish very abundant in the estuaries of the rivers of this colony.

[Isinglass is a very pure kind of animal glue or gelatin, obtained from the dense membrane which forms the air-bladder of the sturgeon, and other fishes of the family; the best is made in Russia. The membranes are washed, the upper layer is removed by scraping, and the rest is dried; it is made either into leaves or sheets, or is folded into square packages. Besides making a very fine glue, and being an excellent material for the sticking-plasters of the surgeon, it is used extensively in the clarification of white wines and malt liquors; this last property it owes to its separation into very delicate fibers, which operate mechanically in removing the impurities to the bottom.]

146. McClintock, W. C., *Demarara.*—Proprietor.
Birds' nests.

BRITISH COLONIES.—NEWFOUNDLAND.

147. Knight, William, *St. John's.*—Manufacturer.
A model of seal-fishery, illustrating the manner of capturing seals, and the localities which they frequent.

FRANCE.

148. Aravon, Honoré, *Marseilles.*—Manufacturer.
Various kinds of soaps.

[Since the substitution of common salt for barilla, in the manufacture of carbonate of soda, Marseilles has lost a great part of its monopoly of soap-making; though, as it is situated in the midst of the oil-producing countries, it is still the chief seat of this manufacture in France. Olive oil is principally used, hence the name of Marseilles soap to that made from this oil.]

149. Leistner, G. L., *Paris.*—Manufacturer.
Eau de Paris, and other perfumery, with fountain.

150. Bully, Jean Vincent, *Paris.*—Manufacturer.
Specimens of aromatic vinegar.

151. Lamar & Pauris, *Paris.*—Manufacturers.
Specimens of fine perfumery.

152. Hugues, J. J., Jr., *Grasse, Var, and Paris.*—Manufacturer.
Flacons of various kinds of essences.

153. Violet, *Paris.*—Manufacturer.
A collection of choice perfumes.

154. Fruchet, *Paris.*—Manufacturer.
Samples of aromatic vinegar; balsamic elixir; toilet cream and essences.

[Eau de Paris is a substitute for eau de cologne, and other similar cosmetics; it is also used internally, as a cordial and stimulant, in the dose of ten or fifteen drops in a little sweetened water; a quarter of a bottle, added to a cold or hot bath, makes a pleasant perfume; it will also take out spots, and preserve woolens from moths. Aromatic vinegar may be made by adding this to pure vinegar; this is used mixed in water, in small proportion, for washing, instead of soap, which last, many French people never use to their faces; a few drops sprinkled in an apartment are highly refreshing. In Paris, there were, in 1847, 110 perfumers, employing 720 work-people in the manufacture of toilet-soaps, cosmetics, essential oils, and perfumery, the value of which was about $2,000,000. One establishment uses annually 80,000 pounds of orange-flower petals, 54,000 pounds of rose-leaves, 32,000 pounds of jessamine, 32,000 pounds of violet, 20,000 pounds of tuberose, 16,000 pounds of mignonette, and 16,000 pounds of lilac.]

155. Botott, *Paris.*—Manufacturer.
Eau de Bottot, a balsamic wash for the mouth.

156. Kapp & Standinger, *Paris.*—Manufacturers.
Tea and cigar boxes, and odor-boxes of various styles; cellarets of rosewood and ebony, style of Louis XV.; various rich paper-boxes in same style; glove, handkerchief, and jewel cases, of various styles, richly inlaid.

157. Blank, Joseph D., *Paris.*—Manufacturer.
Souvenirs and porte-monnaies, richly ornamented with inlaid and mosaic work; ebony looking-glass frame.

158. Kubitschek, *Paris.*—Manufacturer.
A variety of dressing-cases, necessaries, cigar-cases, snuff-boxes, &c.

159. Hannoton, *Paris.*—Manufacturer.
Porte-monnaies.

160. Hennequin, P., *Paris.*—Manufacturer.
Ornamental jewel-caskets.

161. Mace & Boulanger, *Paris.*—Manufacturers.
Dressing-cases of various kinds.

162. David & Chaffnis, *St. Claude, Jura.*—Manufacturers.
Snuff-boxes of various kinds.

163. Glor, Pierre, *Paris.*—Manufacturer.
A great variety of inkstands, watch-stands, necessaries, and other articles in fancy goods.

164. Salleron, Benjamin, *Paris.*—Manufacturer.
A variety of fancy-paper boxes, envelops, and bon-bon cases, for confectioners.

165. Ganivet-Roy, *St. Claude, Jura.*—Manufacturer.
Snuff boxes of various descriptions.

166. Beguin, *Paris.*—Manufacturer.
Fancy and ornamental boxes, in pasteboard, leather, and other materials, for gloves, handkerchiefs, perfumeries, bon-bons, and bijouterie.

167. Dufresne, Gaudet, *Paris.*—Manufacturer.
Artificial flowers and foliage.

168. Royer, P. E., *Paris.*—Manufacturer.
Specimens of artificial branches and leaves.

[In making flowers and fruits of wax, there is little to be done but to copy nature exactly as to form and colors; in making proper "artificial flowers" of cambric, or other similar material, besides accuracy of form and color, more skill is required in imitating nature, and in selecting the most durable and least costly materials. The manufacture of cambric flowers as much belongs to Paris, as does that of cutlery to Sheffield, or that of silks to Lyons. The value of this manufacture, in 1847, was more than $2,000,000, of which $90,000 was exported to the United States. This branch of industry presents a remarkable instance of the division of labor; the materials, as colored papers, buds, leaves, stamens, pistils, fruits, seeds, dyes, and colors, are made in shops devoted exclusively to this manufacture, and often to that of a single seemingly insignificant article. After the flowers are made, great skill is required in grouping the stems, leaves, buds, and flowers, for wreaths, dress and bonnet trimmings, and boquets; this is done in the warehouses of the sellers, by workmen called "monteurs," whose skill is so various that flowers arranged by one will often have double the value of the same flowers arranged by another.]

169. Estublié, Gazagnaire & Co., *Marseilles.*—Manufacturers.
Fishing-nets of linen thread.

170. Mombro, S., *Paris.*—Manufacturer.
A variety of curiosities and bronzes.

171. Saillard, Sen., *Besançon.*—Manufacturer.
Metallic pipe-covers and tobacco-boxes.

172. Cochet-Veady (Widow), *Paris.*—Manufacturer.
Various descriptions of satin, silk, and paper masks.

173. Dumeril, S., Sons, & Co., *St. Omer, Pas de Calais.*—Manufacturers.
Various kinds of clay pipes, and statuettes.

174. Nicod (Widow) & Son, *Annonay, Ardeche.*—Manufacturers.
Twisted and plaited wicks for stearine candles.

[It was soon found that candles of *stearic acid* (which are what is generally understood as *stearine* candles) would not burn with the ordinary wick; a long series of experiments was made, in order to construct a wick which would not sputter the fat during combustion. This was finally effected by the plaited or twisted wick, which renders snuffers unnecessary; the tension of the separate threads causes them to project beyond the flame, and to be rapidly consumed by the air circulating around them. The clogging of these wicks is prevented by treating them with dilute sulphuric acid or, still better, by the borate, phosphate, or sulphate of ammonia.]

THE GERMAN STATES.

175. Daehmel, Heinrich, *Quaritz, Lower Silesia.*—Manufacturer.
Toilet-soaps in fancy designs.

176. Douglass, J. S., & Son, *Hamburg.*—Manufacturers.
A variety of fancy soaps.

177. The following exhibitors, of the same name, inhabitants of Cologne, send specimens of eau de cologne, of which they are the manufacturers:—

Farina, J. Maria,	2	.....	*Julick's Platz,*	....	*Cologne, Prussia.*	
" "	4	"	"	"	"	
" "	*Opposite*	"	"	"	"	
" "	"	*George Platz,*		"	"	
" "	"	*New Market,*		"	"	
" "	"	*Martin's,*		"	"	
" "	"	*Old Market,*		"	"	
" "	*Joseph's Platz,*			"	"	

178. Farina, J. C., *Cologne.*—Manufacturer.
Eau de cologne.

179. Martin, M. C. (Andess), *Cologne.*—Manufacturer.
Eau de cologne, and Carmelite spirit of melissa.

180. Zanoli, Carl A., *Cologne.*—Manufacturer.
Various samples of eau de cologne.

181. Grass, Margareta, *Cologne.*—Manufacturer.
Samples of eau de cologne.

182. Trittan, F. W., *Hamburg.*—Manufacturer.
Herb and flower essences.

183. Rinders (Heirs), *Weimar.*—Manufacturer.
Specimens of blacking.

184. Fechner, F., *Guben, Prussia.*—Manufacturer.
Artificial flowers and leaves; gilt and fancy ornaments and borders.

185. Biersy, Marie, *Dresden, Saxony.*—Manufacturer.
Artificial flowers.

186. Ludwig, Albertine, *Cassel.*—Manufacturer.
Artificial flowers in baskets.

187. Lambell, G. L. de, *Bremen.*—Manufacturer.
Artificial flowers.

188. Van den Hoof, J. P., *Bremen.*—Manufacturer.
Artificial-flower boquets, in frames, by Eberlain.

189. Hermannsdorfer, J., *Nuremberg, Bavaria.*—Manufacturer.
Boxes of colors and drawing materials.

190. Gerhard, E., *Shaalfeld, Saxony.*—Manufacturer.
Specimens of water colors.

191. Wissmath, J. A., *Schweivan, Bavaria.*—Manufacturer.
Snuff, tobacco, and cigar boxes.

192. Hahn, J. P., *Nuremberg.*—Manufacturer.
A large assortment of painted snuff, cigar, and cigarette boxes.

193. Bunger, Jacob, Jr., *Barmen.*—Manufacturer.
Porte-monnaies.

194. Fleisch, N., *Eusheim.*—Manufacturer.
Snuff-boxes of papier-maché.

195. Adt, Brothers, *Eusheim.*—Manufacturers.
Specimens of snuff-boxes and other articles, in papier-maché.

196. Schwenold, P., *Nuremberg, Bavaria.*—Manufacturer.
Snuff-boxes in various styles of painted wood.

197. Kreds, William, *Berlin, Prussia.*—Manufacturer.
Portfolios, porte-monnaies, cigar-holders, fuzee-boxes, spectacle-cases, and many fancy articles.

198. Hartoan & Hube, *Hamburg.*—Manufacturers.
Walking-sticks in great variety.

199. Fleischmann, C. W., *Nuremberg.*—Manufacturer.
Papier-maché figures of the twelve apostles on the German hardware show-case.

200. Menzel, F., *Nuremberg.*—Manufacturer.
Work-boxes.

201. Fleischmann, A., *Somneberg, Saxony.*—Manufacturer.
Model, in papier-maché, of Gulliver among the Lilliputians; toys and fancy articles.

202. Golick & Graff, *Elberfeld, Rhenish Prussia.*—Manufacturers.
Various kinds of buttons.

203. Hostery, Gottfried, *Barmen.*—Manufacturer.
Samples of plated metal and silk buttons.

204. Bechtner, A. J., *Nuremberg.*—Manufacturer.
Chess apparatus.

205. Herzle, Franz J., *Nuremberg.*—Manufacturer.
Specimens of night tapers.

206. Mohr, Friedrich, *Nuremberg.*—Manufacturer.
Night tapers.

207. Kummer, Gottlieb, *Nuremberg.*—Manufacturer.
Taper for night lamps in great variety.

208. Schmidt, Franz, *Nuremberg.*—Manufacturer.
Assortment of compasses and compass-dials for land and sea.

209. Blessing, J. M., *Nuremberg.*—Manufacturer.
A variety of children's go-carts.

210. Knapp, F., *Nuremberg.*—Manufacturer.
Various sets of chess figures.

211. Jahn, H. M., *Dresden, Saxony.*—Manufacturer.
Metal chess-men.

212. Wiedenger, P., *Leipsic, Saxony.*—Manufacturer.
Umbrellas and parasols.

213. Auernheimer, F. A., *Reigensburg, Bavaria.*—Manufacturer.
Composition for hones.

214. Vetter, L., *Nuremberg.*—Manufacturer.
Metallic capsules for closing bottles.

215. Fleischmann, Frederick, *Nuremberg.*—Manufacturer.
Chessboard with chess-men.

216. Simon, William, *Hildburghausen, Saxony.*—Manufacturer.
Figures and toys.

217. Junker, J. G., *Breslau.*—Manufacturer.
A variety of tin toys.

218. Issmayer, J. M., *Nuremberg.*—Manufacturer.
A collection of magnetic toys.

219. Ammon, Christoph, *Nuremberg.*—Manufacturer.
A variety of painted pewter toys.

220. Pabst, G. T., *Nuremberg.*—Manufacturer.
Toy buildings, models of architecture, games, and other toys.

221. Gerlach, C. F., *Nuremberg, Prussia.*—Manufacturer.
Fancy articles and painted toys, of tin, iron, and wood.

222. Distler, G. P., *Nuremberg.*—Manufacturer.
Colored panoramic views and perspective toys of various kinds.

223. Kalb, P. C., Jr., *Nuremberg.*—Manufacturer.
A variety of optical toys, panoramas, and perspective boxes.

224. Boehmlander, J. C., *Nuremberg.*—Manufacturer.
Magic lanterns and various toys.

225. Dippold, *Nuremberg.*—Manufacturer.
Mechanical toys.

226. Birkel, K., *Nuremberg.*—Manufacturer.
Magnetic toys of various descriptions.

227. Hess, Matthias, *Nuremberg.*—Manufacturer.
Pewter toys in great variety.

228. Söhlke, G., *Berlin.*—Manufacturer.
A collection of pewter toys.

229. Baudenbacher, *Nuremberg.*—Manufacturer.
Jugglers' boxes, and various games and toys.

230. Rock & Graner, *Biberach, Wurtemberg.*—Manufacturers.
A various assortment of toys, in tin, iron, brass, pewter, and papier-maché.

231. Hartmann, W., *Nuremberg.*—Manufacturer.
Chessboards, dominoes, and games.

232. Schmidt, J. A., *Nuremberg.*—Manufacturer.
A variety of figures and toys in pewter.

233. Leischner, C. F., *Seiffen, Saxony.*—Inventor and Manufacturer.
Various toys.

234. Krauss, S., *Rodach, Saxony.*—Manufacturer.
Toys in papier-maché, with moving heads.

235. Heyder, J. F., *Nuremberg.*—Manufacturer.
A variety of toy trumpets in tin and brass.

236. Klinger, Abel, *Nuremberg.*—Manufacturer.
A collection of toys.

237. Paulson, Charlotte, *Hamburg.*—Manufacturer.
Toys for instructing children.

[The town of Nuremberg is famous for its toys, the trade of which is of great extent; there is probably not a boy or girl in Christendom who has not been indebted to this town for much of their childish amusements. The progress of the age has extended even to these trifles; the superiority of the crying dolls, the nodding figures, the tail-wagging dogs, the leg-moving horses, the ear-raising rabbits, &c., of 1854, to the stupid and motionless toys of 1830, must be noticed by every one who can recollect the toys of his youth. This desire for improvement is humorously shown by Dickens, in the "Cricket on the Hearth," where Caleb says, "You couldn't have the goodness to let me pinch Boxer's tail, mum, for half a moment, could you?" He explains his meaning by adding, "Oh, never mind, mum; he mightn't like it, perhaps. There's a small order just come in for barking-dogs; and I should wish to go as close to natur' as I could, for sixpence. That's all. Never mind, mum."]

238. Renter, C. H., *Nuremberg.*—Manufacturer.
A variety of counters for whist.

239. Ruppsecht, C. A., *Nuremberg.*—Manufacturer.
A variety of gutta-percha heads and figures.

239A. Beil, F. G., *Nuremberg.*—Manufacturer.
Meerschaum cigar-tubes and pipe-bowls.

240. Kehsen, C., *Erbach.*—Manufacturer.
Paintings on wood and canvas.

241. Dittberner, A., *Breslau.*—Manufacturer.
Pictures made of mosa and paper.

242. Heinrichsen, E., *Nuremberg.*—Manufacturer.
Pewter toys.

THE AUSTRIAN EMPIRE.

243. Ettel, Brothers, *Innsbrück, Tyrol.*—Manufacturers.
Colored wax images.

244. Krischonig, A., *Vienna.*—Manufacturer.
Boquets and baskets of artificial flowers, leaves, and fruits.

245. Kanitz, Charles, *Vienna.*—Manufacturer.
Wax figures, boquets, fans, jewsharps, match-ooxes, and horn buttons.

246. Manschoen, M. F., *Pesth, Hungary.*—Manufacturer.
A Hungarian whip.

247. Puroer, J. B., *Goeder, Tyrol.*—Manufacturer.
Various kinds of dolls and toys.

248. Jewsharps are exhibited by the following makers:—
Schwarz, F., Jr., *Stadt Steyr, Austria Proper.*
Schwarz, Ignaz, " " "
Schwarz, Karl, " " "
Gradner, F., " " "

248A. Zeitler, J., *Vienna.*—Manufacturer.
Tobacco pipe-bowls and cigar-holders, of ivory, meerschaum, and amber.

THE ITALIAN STATES.

249. Farre-Repetto, Pietro, *Porto Maurizio, Sardinia.*—Manufacturer.
Specimens of toilet-soaps.

250. Schielotto, M., *Porto Maurizio.*—Manufacturer.
Specimens of superfine white soap.

251. Aquarone, J. B., & Co., *Porto Maurizio.*—Manufacturers.
Specimens of fine shaving soap.

252. Conti, E., & Son, *Leghorn, Tuscany.*—Manufacturers.
Specimens of fine soap.

253. Giani, *Florence.*—Manufacturer.
Wax flowers.

SWITZERLAND.

254. Wald, A. H. J., *Neuchatel.*—Manufacturer.
Flacons of superior eau-de-Bottot; syrup of punch; hair-oil, of Swiss herbs; curaçao; extract of absinthe, and cream of mint.

255. Finaz, F., *Geneva.*—Manufacturer.
Specimens of aromatic cachon, for sweetening the breath.

THE NETHERLANDS.

256. Perselaert, N., & Son, *Maestricht, Limburg.*—Manufacturers.
Marseilles, Limburg, and other odoriferous soaps; candles, and altar candles.

257. Brannon, N. D., *Amsterdam.*—Manufacturer.
Stearine candles and tapers; lime soap; stearic acid.

[The disagreeable smell of the common tallow candle is in a great measure removed, by purifying it from the decomposing cellular tissue which it always contains. The next improvement in candles was to reduce their melting-point, by employing stearin, which is one of its components, obtained by pressure, and which does not melt till 144° Fahrenheit; tallow melting at 99° to 104° Fahrenheit.

Stearine candles, or those from pressed tallow, contain stearic acid, combined with the oxyd of glyceryl. *Stearic* candles (usually called *stearine* candles, the *true stearine* candles being now rarely used) are made by two processes, known as the *lime* process and the *sulphuric acid* process, both depending on the saponification of fats, and the separation of the fatty acids from the soaps; processes resulting from the beautiful researches of Chevreul and Gay-Lussac.

In the *lime* process, the tallow is melted by means of steam, and ten to fifteen parts of quicklime are added to 100 parts of tallow; a lime-soap is thus formed, with the stearic, margaric, and oleic acids, setting free the oxyd of glyceryl, which, combined with water, forms *glycerin;* the latter, formerly thrown away, is now extensively used as a soothing application in diseases of the skin. The lime-soap, at the temperature of boiling water, is mixed with one-fourth of its weight of sulphuric acid; this forms an insoluble sulphate of lime, when the oily acids are set free, floating on the top, and are run off into flat moulds to cool and crystallize—the sulphate of lime is used as manure. The cakes of fatty acids are then placed in a hydraulic press, and the greater portion of the oleic acid is thus removed. The remaining mixture of stearic and margaric acids is still further purified from oleic acid and other matters, by heat, dilute sulphuric acid, and pressure; it is then melted and moulded, with the plaited wick dipped in borate of ammonia solution.

The *sulphuric acid* process is valuable, as it permits the most impure oils to be used for making the finest candles. The fat is fused by steam; it is then exposed to the action of concentrated sulphuric acid, at a heat of 350° Fahrenheit; about 1-18th part of acid is used. The blackened fats are then distilled at a high temperature, with steam passed through the mass; the fatty acids, as they run from the still, are made into what are called "composite" candles, which are more fusible, and softer than the pressed stearic candles; most of the fat, however, is subjected to great hydraulic pressure, for the removal of the oleic acid. In this process are formed sulpho-stearic, sulpho-margaric, and sulpholeic acids, and sulpho-glyceric acid; the first three are decomposed by water into the slightly modified respective fatty acids, the sulphuric and the sulpho-glyceric acids being dissolved in the water. Palm and cocoa-nut oil are principally used in this process.

The oleic acid, expressed in the above processes, is used for the manufacture of soaps.]

258. Keyzer, M., & Co., *Voorburg, near the Hague.*—Manufacturers.
Samples of eau-de-Voorburg.

259. Van der Wandt, P. J., *Gouda.*—Manufacturer.
Tobacco-pipes.

260. Spaarnaay, F. S., & Son, *Gouda.*—Manufacturers.
Dutch tobacco-pipes.

261. Levysohn, Chevalier J. H. (Old Chief of the Holland Station), *Japan.*—Proprietor.
A collection of Japanese articles, including coins, idols, minerals, and miscellaneous manufactures, in great variety.

SWEDEN AND NORWAY.

262. Hjirta, L. J., & Michaelson, *Stockholm, Sweden.*—Manufacturers.
Samples of olcine potash soap, and stearine candles.

263. Thesen, J. P., *Christiania, Norway.*—Proprietor.
Various specimens of skins of Norwegian animals.

SPAIN

264. Bert, J., & Co., *Madrid.*—Manufacturers.
Specimens of candles and soap.

MEXICO.

265. Levy, Jonas P., *New York City.*—Proprietor.
Mexican vegetable dealers, water-jar carriers, tortilla bakers, &c., in wax; specimens of Mexican fruits in wax. Poisonous spiders (*tarantula*). Specimens of silver ore; ore of copper, gold, and silver. A collection of men and animals carved from a limestone rock by a deaf and dumb Indian, at Quaretio, in 1850; a human skeleton, one inch in length, made by the same. Specimens of native colored marbles. A marble figure sculptured, and earthen figures made by the Aztecs, and dug out of graves near the city of Mexico.

SECTION III. CLASS XXX.

MUSICAL INSTRUMENTS.

MUSICAL INSTRUMENTS were largely represented in the Exhibition; showing at once the variety and excellence, and the commercial importance of their manufacture. The number of piano-fortes was very large, and gave gratifying evidence of the perfection attained in the construction of this, the most indispensable of musical instruments. American-made pianos were found to be well adapted to the changeable nature of our climate, and to remain in tune for a long period. The pianos of foreign makers maintained their celebrity for vocal quality of tone. The commercial value of the pianos made in the United States, alone, is estimated at one-fourth the value of the cotton crop. This is a fact which deserves more attention than has yet been bestowed upon it.

A great variety of brass and wood wind instruments was displayed. The majority of these were exhibited in London, in 1851, and were thence transferred to New York.

The class has several obvious subdivisions:—Wind instruments; stringed instruments; keyed instruments, with fixed tones; instruments of percussion; automatic instruments; detached parts of musical instruments, and miscellaneous articles connected with them.

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1. GEMUENDER, ALBERT, *Springfield, Massachusetts.*—Inventor, Patentee, and Manufacturer.

A church organ on a new principle.

The improvement consists in the air-chambers running the entire length of the scale and of the sounding-board, each chamber supplying all the pipes of a single stop with wind; there are, consequently, as many air-chambers as stops, and each pipe has its own wind connected with the air-chambers, dispensing entirely with sliders. It is not easy to adjust sliders so that they shall move easily, and yet fit closely enough to prevent the escape of wind, as they are affected by the atmosphere. In this organ, the stops will move easily, without the escape of wind, in all states of the weather; this secures more power, promptness, and evenness of tone.

[The tones of an organ are produced by the action of wind in metal or wood pipes, of different forms and sizes; the wind is supplied by bellows, and admitted to the pipes through valves, which are opened by pressing down the keys. The pipes are either *flute-pipes* (corrupted into flue-pipes) or *reeds.*

Flute-pipes produce their tone on the same principle as a flute or a common whistle, viz., by causing a thin stream of air, issuing from a narrow opening, to strike upon a sharp-edged solid blade, whereby a column of air contained in a tube is set in vibration, producing a musical sound; they are made of metal or of wood. The foot of such a pipe is conical, receiving the wind from beneath, and conveying it to a horizontal division just under the mouth, leaving a narrow slit open in front just as in the whistle; through this slit the air enters the tube above, causing the vibrations in it which produce the tone. The pitch of the note depends on the length of the pipe above the mouth; following the simple geometrical law that doubling the length of a pipe makes it speak an octave lower, by doubling the length of the vibrating column of air, halving the length will make it speak an octave higher. An open pipe, 8 feet long, will speak the C, the lowest note of the violoncello, produced by about 128 single vibrations in a second; a pipe stopped at the top will speak a note an octave lower than the same pipe open; the forced return of the column of air to the mouth of the pipe in reality doubles the length of the vibrating column. The quality of the tone depends on the scale and voicing of a pipe. The former means the proportion which the diameter bears to its length; the larger the diameter, or scale, the fuller and more powerful is the tone. The latter, the most important, is the proper formation of the mouth, and the regulation of the quantity of wind received through the opening in the foot. These pipes are best made of pure tin; though, from the expense of this, a mixture of tin and lead is used.

In *reed-pipes*, the sound is produced as in the clarionet, by the vibrations of a thin tongue, of elastic material, set in motion by the wind. The reed apparatus is a small brass tube, having one flat side, in which there is an oblong slit, covered by a tongue of thin hard brass, slightly curved, so as to stand naturally a little from the face of the tube, fixed at one end, and left free to vibrate at the other; the wind, rushing through the opening left by the valve, presses it down, when its elasticity instantly raises it again; the rapid repetition of this action causes a series of vibrations, communicating with the small pipe of the reed; to these the sound is ascribed, the tongue being only the instrument which produces them. The pitch is determined by the length, thickness, and elasticity of the tongue, and not by the length of the tube. The quality of the tone depends much on the tube, which should be of such a size that the vibrations of the column of air contained in it should correspond exactly with those given by the reed; by varying the diameter and form of the tube, a variety of reed-stops may be obtained. The tone of reed-stops is sharp, brilliant, and powerful; the pipes are made of tin, or of tin and lead, or, in the largest, of wood.

A *stop* is a range of pipes, of the same character of tone, extending through the compass of the instrument, generally one to each note, impressing its peculiar character on all the keys. The tone of every key in a large organ consists of notes of different pitches, combined so as to give the effect of one sound. The first organs consisted of the fundamental note only, the 8-feet or unison stop; then a 4-feet stop, sounding the octave above, and a 2-feet stop, sounding the fifteenth, were added, with great addition of power. Harmonic intervals were then added; a 2⅔-feet stop, speaking the twelfth of the fundamental note, was the first; these four stops make a very tolerable organ. The third and fifth of the major common chord were added, in octaves above the fifteenth, with a very brilliant effect; to obviate the shrillness of the higher notes of the scale, and the want of weight in the lower, the octave below, or the 16-feet stop, was added, without which a very large organ could hardly be constructed. A 32-feet stop will speak two octaves below the fundamental note. Thus any key sounds, not only the note proper to it, but also two octaves above, two below, and repetitions of the harmonic intervals of its common chord, according to the size of the organ. There are also several "fancy" or "solo" stops, generally 8-feet in pitch (and 4-feet), both flute and reed. A favorite flute-stop is made, by so voicing an open wood pipe as to give a reedy quality to the tone. The silvery tone of the *dulceana* is produced by an open metal pipe, of a very small scale. Among the reeds, the form of the tube varies the quality of tone. The *oboe* stop has a bell mouth; a parallel tube gives a *clarionet* tone. The *vox humana* is usually a variety of reed-stop; the English, a reed with a double cone at the top of the pipe; the French, a cylindrical tube, partly closed at the top. In large organs, the *cornopean* is a reed-stop; the *prum-horn*, of thinner and softer tone, a solo reed-stop, with a cylindrical pipe; the *wood-flute*, an open wood stop; the *claribel*, an open wood stop, much used in solo playing; the *hohl-flute*, an open metal pipe, with a clear reedy tone; the *tuba mirabilis*, a very powerful reed-stop; the *viol di gamba*, an open metal pipe of a small scale, tapering upwards, and terminating in an inverted cone, the tone being thin in quality; the *viola*, of the same quality, speaks an octave higher; the *corno di bassetto*, a reed-stop, with clarionet tone; the *cremona*, similar, but speaking an octave higher; the *trumpets*, *clarions*, *trombone*, and *tromba*, are reed stops.

The number of the stops in a large organ renders it convenient for the performer

to have more than one key-board; there are accordingly three organs, each having its key-board, perfectly distinct from each other; and, in addition, there is a fourth organ for the feet, called the "pedal organ." The most important is the "great organ," containing the stops of the greatest power, its key-board being generally the lowest but one; its compass is 4½ octaves, beginning with C (8 feet) as the lowest note. The lowest key-board belongs to the "choir organ," of smaller size, containing the lighter stops; it is of the same compass. The upper key-board belongs to the "swell," an organ shut up in a box closed on three sides, the fourth closed by shutters, arranged like Venetian blinds, which may be opened and closed by a pedal; by gradually opening and shutting these, the power of *crescendo* and *diminuendo* is given, with fine effect; the compass in large organs is the same, but stopped pipes are often used for the lower notes. The "pedal organ" is played by the feet, the compass is from 2½ to 2½ octaves, beginning with C, as the lowest note; the stops are 32-feet, 16-feet, 8-feet, and 4-feet, both flute and reed. In many organs this is not separate, the pedals only pulling down the keys of the great organ, with the addition of pedal pipes.

Many ingenious mechanical contrivances are introduced into modern organs, of which only two can be mentioned here. The most important, perhaps, is what are called *couplers*, by which the keys act on each other, for the purpose of giving power and variety; for instance, the "great organ" may be made to play all the others; or any two key-boards may be united together; or any key may be made to pull down its octave above or below; they are managed by draw-stops or by pedals. The other is the opening or shutting the stops by means of pedals, a very great convenience to the performer.]

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2. Hall, William, & Son, *New York City.*—Manufacturers.
French grand action piano-forte, of 7½ octaves, in double-serpentine case of crotch and mottled oak, with carved plinths.

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3. Hazelton & Brother, *New York City.*—Manufacturers.
A piano-forte of carved rosewood.

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4. Bennett & Co., *New York City.*—Manufacturers.
A rosewood piano-forte.

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5. Grovesteen & Co., *New York City.*—Manufacturers.
Two piano-fortes, of rosewood; and one of papier maché, with pearl keys, highly ornamented.

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6. Lighte & Newton, *New York City.*—Manufacturers.
A piano-forte of 7½ octaves.

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7. Holden, Charles J., *New York City.*—Manufacturer.
A piano-forte of 7½ octaves, with serpentine front, and highly finished.

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8. Waters, Horace, *New York City.*—Proprietor and Agent.
An Æolian piano-forte, made by Gilbert, of Boston.

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9. McDonald & Brother, *New York City.*
A rosewood piano-forte, with patent Euterpean attachment.

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10. Lankota, Jean, *New York City.*—Manufacturer.
Rosewood grand piano-forte, of seven octaves.

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11. Bassford, A., *New York City.*—Manufacturer.
Grand piano-forte, in rosewood case.

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12. Firth, Pond & Co., *New York City.*—Manufacturers.
Semi-grand piano-forte, of seven octaves.

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13. Hallett, Davies & Co., *Boston, Massachusetts.*—Manufacturers.
Grand and square piano-fortes.

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14. Hews, George, *Boston, Massachusetts.*—Manufacturer.
Square piano-forte, richly carved.

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15. Schomacker, S. H., & Co., *Philadelphia, Pennsylvania.*—Manufacturers.
Piano-forte, in rosewood, of seven octaves.

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16. Knabe, Gaehle & Co., *Baltimore, Maryland.*—Manufacturers.
Two square pianos, in richly carved rosewood cases.

[The piano-forte is the most valuable of our musical instruments; it is portable, easy to play upon, and tolerably correct in its intonation, and for these reasons admirably adapted to the wants of a music-loving people at their own firesides.

Stringed instruments are of great antiquity, but the piano is an invention of the last century. The instrument which immediately preceded it was the harpsichord, in which the wires were struck by quills, moved by keys, instead of hammers. The piano has been claimed by various nations, Germans, Italians, and English; the most generally received opinion is, that it was invented in Germany, by Schröter, about the beginning of the last century. Pianos are made generally in three forms, the grand, square, and upright. The *grand* piano, of an irregular shape, according to the gradation of the lengths of the strings, is perhaps the most advantageous form, admitting the best mechanism, and being the most durable; it has three strings to each note, and is generally an expensive and first-class instrument. The *bichord* and *semi-grand* are cheaper modifications, having only two strings to each note; the *boudoir* and *cottage* grands have shorter strings, and take up less room. The *square*, or common oblong piano, was the original form; with the improved action of the grand piano, these are excellent instruments; though, from the greater difficulty of strengthening the framing, and the oblique position of the action, it is a less perfect instrument. The *upright* piano, in which the strings are arranged vertically or obliquely, has the great advantage, that the strings are struck against their rests; they are very convenient instruments, from their small size, and are generally of sufficient power. The *piccolo* is a small upright piano, not more than 3½ feet high.

The compass of the piano was, originally, from the F below the lowest note of the violoncello, to the fifth F above; another octave was added above, and half an octave in the base, down to C; another note was then added in the treble, making the compass extend from CCC (on the organ 16-feet C, of 64 vibrations in a second) to G, 6½ octaves above; they are now made of 7, 7½, 7½, and even 8 octaves (the latter by Pape, of Paris).

On the strength of the frame depends the durability of the instrument, and its power of keeping in tune; it is made of the best seasoned oak, or other hard wood, strengthened and braced by bars, and string-plate of wrought iron or steel; in the pianos made by Chickering, of Boston, Massachusetts, the whole framing is made of cast iron, in one piece, combining strength, unity of action, and cheapness. The surface of wood lying immediately under the strings is called the *sound-board*, on which depends the tone of the instrument; it is analogous to the belly of the violin, and is made of a thin board of the best pine, free from knots and flaws, cut in a particular direction of the grain, and thoroughly seasoned; it is strengthened by ribs on the under side, and put together with great care. The *strings* are made entirely of steel wire, brass being too weak; the lowest octave of the base is of lapped wire, or of steel wire wrapped with iron, soft steel, and sometimes by copper wire, closely wound; one wire, of double length, is made to form two strings; the two ends are wrapped round two adjoining wrest-pins, the middle of the wire being bent over a stud in the string-plate, the pressure on which is sufficient to keep the strings distinct, as far as tuning is concerned. The strings are put in vibration by means of small hammers, connected by levers with the key-board; the hammers quit the string the moment it is struck, a damper falling down upon it the moment the finger quits the key. The covering of the face of the hammer, which was formerly of buff leather, is now made of a fine kind of felt, made expressly for the purpose, which gives a much finer quality of tone. By removing the action of the dampers, by a pedal, the sound is prolonged ad libitum; the old way of producing the soft tone was to shift the action so that the hammers would strike two strings instead of three, or one instead of two; the French method is now generally adopted of interposing a piece of soft cloth between the hammer and the string, which deadens the blow, and produces a very pleasing effect, without the risk of putting the instrument out of tune by striking upon only one string.

One of the recent American improvements is the "dolce campano" pedal, by which the sound is prolonged, and the quality changed to that of sweet bells or harps. The mechanism is simple, being merely a number of weights arranged by a lever pedal to fall when required upon an equal number of screws fixed in the sounding-board; this, of course, alters the vibrations, and, in connection with the other pedals, produces great brilliancy and delicacy of tone, like the chimes of distant bells, whence its name.

The "Æolian attachment" consists in the addition of a seraphine, a free-reed instrument, filled by a bellows, which can be played upon with the piano, by the same keys.]

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17. Ruck, John, *New York City.*—Inventor and Manufacturer.
Patent universal, repeating, grand-action, for piano-forte.

[In the old action of the piano-forte, after the hammer has fallen, the key must rise to its position of rest, before the hopper will again engage in the notch of the hammer, and be ready for another stroke; so that the repetition of a note required the removal of the finger from the key, and a sufficient time for the key to rise to its natural position. The different ways of overcoming this inconvenience act on the principle of holding up the hammer to a certain height while the key returns, by which the hopper can sooner engage itself under the hammer, and reproduce the note with any desired rapidity, with ease to the finger.]

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18. Bowden, W. H., *New York City.*—Manufacturer.
A miniature piano-forte, 18 inches in length, one-16th of the ordinary 6-octave instrument, exact in its proportions and details, composed of nearly 3,000 separate pieces.

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19. Prince, George A., & Co., *Buffalo, New York.*—Manufacturers.
Melodeon, with two sets of reeds, in carved rosewood case.

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20. Gardner, William P., *New Haven, Connecticut.*—Patentee and Manufacturer.
Rosewood melodeons, with new patent bellows, and other valuable improvements.

[The class of instruments to which the melodeon belongs, combines volume of tone, compass, sustaining power, and expression, with simplicity of construction and smallness of size. The tones are produced by a free-reed apparatus, in which the brass tongue, instead of beating against the pipe as in the organ, oscillates freely within the opening; as it closes this as nearly as possible, it checks the current of air at each vibration, in the same manner as the beating-reed, the effect being a series of pulsations, producing a musical tone. The advantages of the free-reed are, a more agreeable, smooth, and mellow quality of tone; it requires no pipe (very important on the score of

simplicity, compactness, and cheapness); less liability to derangement, as it encounters no obstacle in its vibrations; and the power of varying the expression and power of the tone, by modifying the pressure of the wind.

This principle was first applied to small instruments, still used as toys, called harmonicas, blown by the mouth; it gradually became more extended in its application, and a hand-bellows and a set of keys were attached, forming the accordion; the concertina is on the same principle, with a different arrangement of details. By enlarging the scale of the accordion, it became so unwieldy that a regular key-board was added, and the wind supplied by bellows as in the organ; the instrument thus became in fact an organ, having a free-reed stop, without pipes, and was called a seraphine; in order to secure rapidity and precision of action, and brilliancy of tone, a small hammer, connected with the key, gave a gentle blow to the reed at the moment of the opening of the valve. Seraphine, harmoneon, melodeon, physharmonica, reed-organ, &c., are names for essentially the same instrument. The best instruments have a compass of five octaves, the lowest note being 8-feet C, the lowest note of the violoncello (128 vibrations in a second); the keys open valves, by which the wind from the bellows, worked by the feet of the performer, is allowed to act on the reeds; the reeds are in duplicate, so that whether the bellows be expanded or compressed, the same note is always sounded by the same key. Four stops are often added to these instruments, by which many of the effects of a small organ are obtained.]

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21. Brown, John F., *New York City.*—Manufacturer.
Grand gothic double-action harp, of 6¾ octaves, and music-stand.

[The simplest form of the harp was a triangular frame, furnished with a set of strings, one end of which was fixed, and the other wrapped round a pin, which could be turned to give any required tension; the only practicable sound-board was made by extending and flattening the side of the frame to which the strings are attached below. In this form, the seven notes of the diatonic scale were repeated in different octaves, and of course only the key to which it was tuned could be played in; there was no provision for chromatic semitones, or accidental flats and sharps. To remedy this, some of the most-used chromatic notes were added, but this increased greatly the difficulty of playing. The next method was, by having three rows of strings, arranged in three parallel planes, a little distance apart; the two external were tuned in unison diatonically, while the middle row furnished the chromatic semitones; this was found quite unmanageable. The difficulty was at last obviated by pedals, the mechanism of which did not arrive at any great perfection till 1794, when Sebastian Erard took out his patent; from this time, the harp became one of the most complete of modern instruments.

Erard's pedal harp had a single row of strings, of about five octaves in compass, arranged diatonically; from the foot projected seven pedals, connected by machinery concealed in the upright pillar, with small studs, which stopped the strings near their upper end when the pedals were depressed, and sharpened them one semitone; the seven pedals corresponded to the seven notes of the scale, and each sharpened its proper note through the whole compass of the instrument; by a notch in the frame, the pedal could be permanently depressed. The instrument was tuned in its natural state, in the diatonic scale of E flat; so that, by using all the pedals, there was a range of eight keys, between E flat and E natural. As music became more complicated, it became necessary to go beyond this; Erard then introduced the "double-action" harp, in 1808. The seven pedals, by means of two notches, had each a double movement, by which each string could be sharpened one or two semitones at pleasure; the open strings are tuned in C flat; by means of the pedals, the instrument can be put into any key between this and C sharp; every major key, and all minor keys, except A, D, and G sharp, can be produced on it. In the latest improved harps, enharmonic passages can be produced, which no instruments but those of the violin class can do. To explain this, it will be necessary to state that there are three musical scales: the diatonic, proceeding by tones and semitones; the chromatic, proceeding by semitones only; and the enharmonic, in which there is a succession of every possible note, according to its number of vibrations; on an enharmonic instrument, C sharp and D flat, which are distinct sounds, become distinct notes, while both are struck on the same key of the piano and common organ; there is an organ, invented by Mr. Poole, of Boston, which is a perfect enharmonic instrument.

The harp has now about the same compass as the piano, ranging from 6 to 6¾ octaves. In order to distinguish the notes, it is common to have every C string colored red, and every F string blue; the strings are made of the finest catgut; some of the lower notes are of silk, lapped with fine silver wire.]

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22. O'Neil, P., *New York City.*—Manufacturer and Proprietor.
An American portable harp, capable of transposition into various keys.

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23. Mount, William S., *Stoneybrook, Long Island.*—Inventor, Patentee, and Proprietor.
Violins of a new model, with hollow back, of great simplicity of construction, and of increased power and sweetness of tone. These are composed of from 28 to 30 pieces, while ordinary instruments require about 58; the strain of the strings comes upon the back and sides; the sound-post is shorter than in other instruments.

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24. Gemuender, George, *New York City.*—Inventor and Manufacturer.
Violins, tenor, violoncello, and double bass, in imitation of Straduarius, Guarnerius, and Amati. These violins are made of American materials, except the strings; they produce the same quality of tone with the old Italian instruments, but the French method of preparing the wood, by a chemical process, is obviated by a new method.

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25. Robertson, William, *New York City.*—Inventor and Manufacturer.
Keyed-stop violins, a new invention.

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26. Baack, Edward, *New York City.*—Importer.
A fine violin, made by Aug. Glass, of Germany.

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27. Mirment, *New York City.*—Manufacturer.
Violins, altos, bass and counter-bass, in imitation of the violins of the 15th century.

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28. Strobe, John, *New York City.*—Manufacturer.
Specimens of violins.

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29. Neff, Joseph, *Philadelphia, Pennsylvania.*—Manufacturer.
A quartette of stringed instruments, viz., two violins, a tenor, and violoncello.

[The modern violin, the noblest of musical instruments, has four gut-strings, the last, or lowest, covered with silver wire; they are tuned in fifths, E, A, D, G; the back, neck, sides, and circles, are generally made of sycamore; the belly, bass-bar, sound-post, and six blocks, of deal; the finger-board and tail-piece, of ebony. The finest violins were made at Cremona, by the Amati, by Guarnerius, and Straduarius; there were three violin-makers, of the name of Guarnerius, who lived about 1700, the best of whom was Joseph; Straduarius was a pupil of Andreas Guarnerius; their instruments are valued at from 500 to 2,000 dollars, and even more. The viola, or tenor, is a larger kind of violin; it has four gut-strings, the two lowest covered with silver wire, which are tuned A, D, G, C, an octave above the violoncello. The violoncello has four gut-strings, the two lowest covered with silver wire, tuned in fifths, A, D, G, and C. The double bass, or contrabasse, is the largest instrument of the orchestra; it is tuned in fifths, E, A, D, G, two octaves below the violin. The German instrument has four gut-strings, the two lower covered with silver wire, and considerably thicker than those of the violoncello; the Italian instrument has but three strings.]

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30. Marten, C. F., *Nazareth, Pennsylvania.*—Manufacturer.
Two guitars.

[The modern Spanish guitar has six strings, three being of silk, covered with silver wire, and three of catgut; its compass is from E below the bass-staff, to A above the treble-staff, including all the intermediate semitones.]

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31. Gould, Napoleon W., *New York City.*—Manufacturer.
An improved transposing guitar, and improved banjo.

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32. Cargill & Co., *New York City.*—Manufacturers and Importers.
Guitar, accordion, flute, brass musical instruments, and fine strings.

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33. Jacobs, J., *New York City.*—Manufacturer.
Accordions, with improved reeds; banjo, with new arrangements for tuning; tambourine, with flush screws.

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34. Resch, John, *Brooklyn, New York.*—Manufacturer.
Pearl-keyed accordions, and a banjo.

[The usual form of the accordion is a pair of rectangular single bellows, one board being held in each hand; the air is drawn in by separating the hands, and vice versâ. The board held in the right hand contains the reeds, finger-keys, and valves; each key covers two reeds, corresponding to two notes, one being sounded during expansion, the other during compression, of the bellows; the object being to increase the compass, without having too many keys. There are also a few chord-keys; and a wind-valve, managed by the left hand, by which the bellows may be opened or shut without producing sound. It is a very imperfect instrument, and its effects are monotonous.]

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35. Zoeaitch, C. A., & Sons, *New York City.*—Manufacturers.
Musical instruments, of German-silver and brass, with rotary valves; guitars.

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36. Lauter, F., *New York City.*—Manufacturer.
Clarionets, bassoons, flutes, oboes, and other instruments.

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37. Christman, E. P., *New York City.*—Manufacturer.
Clarionets, flutes, trumpets, sax-horns, tuba, and bugles.

[In musical instruments, three things are to be distinguished; the body which produces the sound, the regulating medium, and the resonant mass. In the piano, these are respectively the hammer, the string, and the sounding-board; in wind instruments, the air-blast from the mouth, the air in the tube, and the friction on the body of the instrument, are the three characteristics. The air-blast being perfect as a sounding body, the makers of wind instruments have turned their attention to the improvement of the regulating medium, by avoiding angles, &c.; the improvement of the sounding mass, or the form and quality of the instrument, has also been very great. Brass is the metal almost universally employed as the resonant mass; the use of valves and the substitution of bulbs for angles, has very much softened the tones, and increased facility of execution. M. Adolphe Sax, of Paris, has made the greatest improvements in orchestral brass instruments, and his name has been prefixed to a most important class of military horns and trumpets. His sax-horns, double bass in E flat, and B flat, have far surpassed the ophicleide; the sax-horn bourden is a monster ophicleide. 10 feet high, with 48 feet development of tube; the small treble sax-horn, in B flat, is the only brass instrument which can certainly and purely strike the notes of the upper

octave of the flute; the saxophone is a brass instrument, soprano, alto, and bass, with a mouth-reed like the clarionet. He has added a semitone to the lower register of the clarionet, and a new key, by which the performer can take the upper notes at once, with the greatest ease; he has also filled up the gap which existed between the lower E and the lowest B flat of the tenor trombone.]

38. Eisenbrandt, E. H., *Baltimore, Maryland.*—Manufacturer.
Specimens of gold and silver keyed clarionets, and flutes.

39. Ernst, P., & Sons, *New York City.*—Manufacturers.
Flutes of glass and silver.

[The three kinds of clarionets generally used, are the C, B flat, and A, the compass being from E in the bass to G in altissimo; it was invented about a century and a half ago. Small shrill clarionets, of E flat and F, are used in military music. Flutes are made of hard woods, ivory, glass, metal, and even vulcanized India-rubber; the middle tones are always the finest. The oboe, or hautboy, is a reed instrument, of a compass from C below the treble clef to G, the fourth added line above it; its tones are sweet and plaintive. The bassoon, or fagotto, is a bass oboe, made of several tubes of wood bound together, whence its name; its compass is from B flat below the bass staff, to B flat in the treble staff.]

40. Dodworth, H. B., *New York City.*—Proprietor.
Brass-keyed instruments for bands.

41. Blunt, H. S., *New York City.*—Inventor.
Improved system for transposing the musical scale, by wheel and sliding scale.

GREAT BRITAIN AND IRELAND.

42. Stodart, William, & Son, *London.*—Manufacturers.
A patent horizontal grand piano-forte, in black-walnut case, with rosewood carvings in the Elizabethan style; a patent square piano, in the Louis XIV. style; a cottage piano, in walnut wood.

43. Bray, John, *Dublin.*—Manufacturer.
Patent double-action harp, in birds'-eye maple and gold, of superior workmanship.

44. Scates, Joseph, *Dublin.*—Manufacturer.
Specimens of concertinas.

[The *concertina* is a free-reed instrument; the bellows are usually of an octagonal shape, and the reeds and keys are contained in both boards, so as to be played on with both hands. The keys are small cylindrical studs, projecting from the middle of the boards; the boards are held by straps, passing round the back of the hands, the fingers being thus at liberty. The reeds are in duplicate, and each note has a separate key; its compass is from 3 to 3½ octaves, with a complete chromatic scale, so that it can be played on in any key; the usual kind corresponds in compass with the violin; some correspond to the viola and violoncello. It has great facility for expression, by using more or less wind.]

BRITISH COLONIES.—CANADA.

45. Ziegler, J. B., 66*th Regiment, Quebec.*—Inventor.
An improved registered cornopean, with valve-perfecting slide.

[This improvement enables the performer on cornets, and other valve-instruments, to sharp or flat any note, or a given number of notes, with facility. With the exception of the change in form which this improvement involves, the instrument is similar to the ordinary ones of its class. It is well known that the pitch of this class of instruments is regulated by elongating or shortening the passage for the wind; if this can be momentarily produced, any note in a piece of music may be made sharp or flat. By means of a sliding barrel, regulated by a thumb-piece, the passage may be shortened and the note sharpened; thus considerably diminishing the exertion required to play intricate pieces in perfect tune. The superiority of this instrument consists in perfecting the third and fifth of the key (the former being too flat and the latter too sharp), and any note in the scale not in tune; a fault in many cornets and other valve-instruments—in the double scale, facilitating the performance of passages difficult in the ordinary scale—in the glide, either ascending or descending, practicable only with the voice, violin, or slide-instruments. The invention is applicable to all valve-instruments.]

FRANCE.

46. Detir, N., & Co., *Paris.*—Manufacturers.
Upright seven-octave piano-forte, with semi-oblique strings; upright rosewood piano, with vertical strings.

47. Sholtus, *Paris.*—Manufacturer.
An upright seven-octave piano-forte, in rosewood.

48. Debain, A., *Paris.*—Manufacturer.
Mechanical piano and appliances.

[This has been applied with success as a substitute for organs and harmoniums; it is said to be superior to the barrels used in church organs, and less costly.

The flat surface of the upper portion is covered with a metal plate, pierced across its width with a series of openings, which admit through them a corresponding number of metal points, projecting about the eighth of an inch above the plate. These points are the ends of small levers, which communicate with the action; thus the upper level surface of the machine forms a complete key-board; the projections are pressed down to perform the music by a small piece of hard wood, studded with pins, which is forced over the level surface. This piece is held down by a bar, and the pressure regulated by springs; it is passed over the key-frame by turning a handle, and, as the pins come in contact with the keys, the notes are struck, loud or soft, as may be required. The pieces studded with pins may be from 4 to 24 inches long; 8 inches will contain as much as a page of music paper, and any number of pieces may be used for long compositions; while one piece is playing, another should be held in readiness to succeed it, till the piece is finished. The mode of studding the wood with pins is simple and easily executed. The mechanical apparatus can be placed on the piano as a cover, and, by a simple contrivance, on opening the instrument, the mechanical action is removed, and the tone of the instrument is the same by the ordinary method of playing; on closing the piano, the attachment resumes its place, and is ready for use.

When applied to the organ, as pressure on the keys is only necessary, the attachment is placed over the key-board, and appears like fingers pressing down the keys.

It has been very frequently played during the Exhibition, producing music of the most brilliant character.]

49. Musard, Brothers, *Paris.*—Manufacturers.
Upright piano-forte of rosewood, with bronze ornaments.

50. Pleyel, *Paris.*—Manufacturer.
Piano-fortes.

51. Eaard, *Paris.*—Manufacturer.
An upright piano.

52. Glor, *Paris.*—Manufacturer.
Claviphones.

THE GERMAN STATES.

53. Hechinger, F., *Ulm, Wurtemberg.*—Manufacturer.
A large organ, with improved method of blowing, securing a steady and uniform amount of wind. A small organ.

54. Gehde, M., *Rattibor, Prussia.*—Manufacturer.
A zebra-wood grand piano-forte.

55. Trayser, P. J., *Stuttgard.*—Manufacturer.
A seraphine in black-walnut case.

56. Nickel, Christian, *Heilbronn, Wurtemberg.*—Manufacturer.
A physharmonica, a kind of seraphine.

57. Neuner & Hornsteiner, *Mittenwald, Prussian Silesia.*—Manufacturers.
A quartette of stringed instruments, violins, tenor, and violoncello; guitars.

58. Herold, C. G., *Klingenthal, Saxony.*—Manufacturer.
A violin.

59. Klemm, Geo. & Aug., *Neukirchen, Saxony.*—Manufacturers.
Bass and stringed instruments; Bresciano counter-bass and violoncello, bass-viol, violins, and guitar. Wind instruments; cornet and alt-horn trombones, brass instruments for bands, flageolets, clarionets, &c.

[Bresciano was a noted maker of bass instruments. The trombone is a trumpet composed of sliding tubes, by which every sound in the diatonic and chromatic scales within its compass can be perfectly obtained. The alto trombone is from C, the second space in the bass, to G, an octave above the treble clef; the *tenor*, from B, second line in the bass, to A, second space in the treble; the *bass*, from C, an octave below the second space in the bass, to G, second line in the treble.]

60. Kloss, Ernst, *Bernstadt, Prussian Silesia.*—Manufacturer.
A violin.

61. Schuster, M., *Neukirchen-on-the-Rhine.*—Manufacturer.
A variety of musical instruments, violins, and guitar.

62. Glier, Ferdinand, & Son, *Klingenthal, Saxony.*—Manufacturers.
Various musical instruments, in brass and German-silver; violins and guitars.

63. Pfaff, F., *Kaserslauter.*—Manufacturer.
A variety of brass instruments.

64. Ruhlmann Carl, *Rudolstadt, Thuringia.*—Manufacturer.
Various wind instruments.

65. Kuhlewein & Tetzner, *Hamburg.*—Manufacturers.
Various musical instruments.

66. Klein, C., *Mentz-on-the-Rhine.*—Manufacturer.
Musical instruments for brass bands.

67. Pfaff, G. M., *Kaserslauter-on-the-Rhine.*—Manufacturer.
Ophicleide and trumpets.

68. Zenker, C. G., Jr., *Adorf, Saxony.*—Manufacturer.
A clarionet and flute.

69. Leschorn, Christian, *Cassel, Hesse Cassel.*—Manufacturer.
Bass tuba, trumpet, and piccolo in C.

70. Pirazzi, G., & Sons, *Offenbach-on-the-Maine.*—Manufacturers.
Samples of German and Italian strings for musical instruments.

71. Weiss, Carl W., *Gunzenhausen, Bavaria.*—Manufacturer.
Specimens of strings for musical instruments.

[*Catgut* is the name applied to strings made from the peritoneal covering of the intestines of the sheep. The greatest care is necessary to prepare these strings for the violin, the harp, and similar instruments, to secure the strength necessary for the great tension required for the high notes. The best strings are made at Naples, because the sheep, from their leanness, afford the best raw material; it is a well-ascertained fact that the membranes of lean animals are much tougher than those of animals in high condition.]

THE AUSTRIAN EMPIRE.

72. Czerweny, W. F., *Koeniggratz, Bohemia.*—Manufacturer.
A great variety of fine wind instruments, in brass and German-silver; a newly invented phonikon horn, called zwukorch.

73. Pelleti, Guiseppe, *Milan, Lombardy.*—Inventor and Manufacturer.
Wind instruments, in brass and German-silver, viz., a pellitone, a brass instrument in C; C duplex, an instrument producing the tones of the trumpet; B duplex, the trombone; bombardons; trumpet, in G, with mechanism for transposing into all keys.

74. Bittner, D., *Vienna.*—Manufacturer.
A guitar.

75. Steinkellner, Chaistian, *Vienna.*—Manufacturer.
An extensive assortment of accordions, of all sizes and styles.

76. Kanitz, Charles, *Vienna.*—Manufacturer.
An assortment of accordions

THE ITALIAN STATES.

77. Rocca, Giuseppe, *Turin, Sardinia.*—Importer and Manufacturer.
A guitar with twelve strings, of new invention; two violins.

SWITZERLAND.

78. Huni & Hubert, *Zurich.*—Manufacturers.
Grand and square piano-fortes.

79. Sprecher & Co., *Zurich.*—Manufacturers.
An upright piano-forte, of a novel and superior construction.

BELGIUM.

80. Lacroix, Mathieu, *Verviers.*—Manufacturer.
An upright cabinet piano-forte, of superior construction, with iron frame, and key-board which may be transposed to accompany the voice. A mechanical table piano-forte—an elegant piece of furniture, and ingenious piece of mechanism; to appearance, a marble-topped center table, but on raising the top is seen the interior of a piano. A revolving cylinder, turned by a spring, by the projections on its surface acts upon the hammers which strike the strings; it will play several tunes, with great sweetness and precision, and may be easily arranged to play any desired air; when wound up, simple pressure of the knee against a spring, under the table, sets the mechanism in motion, and arrests it at pleasure. It is difficult to believe that the music, of a complicated character often, proceeds from a piece of furniture so unlike a musical instrument.

[The object of transposing pianos is to suit voices whose compass would not allow of their executing music in the original key; by playing, for instance, in the key of C, a song may be made to sound in the key of C sharp; D, E flat; B, B flat, or A; that is, in any key within three semitones above or below the original one. The usual way is, to move the key-board laterally, or the strings and framing, to make one hammer strike different strings; in some methods, neither the action nor the strings are movable, but the keys are divided in a complicated manner posteriorly. It is a contrivance which may be of service to inferior singers, but no true musician will ever look upon such unscientific aids to the voice with approbation.]

NETHERLANDS.

81. Paling, J. H., *Rotterdam.*—Manufacturer.
An upright piano-forte.

NORWAY.

82. Thanlew, Dr. H. A., *Modum, Norway.*—Proprietor.
A psalmodicon, a Norwegian musical instrument.

SECTION IV. CLASS XXXI.

FINE ARTS.

In no department has the Exhibition been more fortunate than in that of sculpture—not for the number and variety of excellent works, but for the adequate representation of the two great schools, the ideal and the natural, into which this art has been divided ever since the third period of its history in Greece. In the number of contributions, Italy naturally takes the lead. The United States are well represented; France, England, and Germany, have sent specimens of their best workmanship; and Denmark, eighteen statues and twenty-six bas-reliefs of Thorwaldsen.

A large proportion of the Italian works consists of copies from the antique, and from celebrated pieces of modern masters, having no other claim to especial commendation than as specimens of that facility of mechanical execution which must naturally result from long and constant practice. Among these, the copies of the "Flora of the Capitol" deserve attention, for they give a fair specimen of the admirable management of drapery which distinguished the great school they belong to. Bartolini's Faith is copied accurately, and finished with great delicacy of touch, and some of the heads and reduced copies are well done. Of the original works, many, like the Columbus, belong to the conventional school of good taste and tame imitation. Santarelli's two figures, "Harpocrates," and "Cupid in a mischievous mood," though not remarkable for originality, are beautiful works, occupying, like the Psyche and Guardian Angel of Bienaimé, the same place that would be given to a poem of Rogers, or, with the exception of his odes, to Campbell, in the sister-art.

Canova's Hebe was one of those graceful figures which will always secure the author a place among the eminent artists of the age, though not the place which his admirers claim for him.

The great artistic attraction of the Exhibition was the division set apart for the statuary of Thorwaldsen. For a fuller account of these great works, we must refer to the "Illustrated Record." We would refer to them here as specimens of the purest form of ideal art, founded upon a careful study of nature and the ancients.

The natural school was well represented by its greatest living master, Powers. The merits of the three beautiful figures which bore his name are of that kind which every man will readily appreciate—a faithful copy of nature, communicating a perfectly flesh-like surface to the marble. Nothing can exceed the perfection of the workmanship, but the eye is soon satisfied with a style of art which aims at nothing higher than a careful elaboration of details.

The brass-foundry of Geiss, of Berlin, furnished several specimens of statuary in bronze, a branch of the art particularly adapted to monuments and statues designed for the open air. All of these works were of a high order. The most perfect was the Amazon, by Kiss, of which an engraving and full description will be found in the "Illustrated Record," p. 44.

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1. Powers, Hiram, *Cincinnati.*—Sculptor.
Eve, full figure in marble (property of Colonel J. S. Preston, Columbus, South Carolina).
The Greek Slave, full figure in marble.
The Fisher-boy, full figure in marble.
Proserpine, a head in marble (property of Sidney Brooks, Esq., New York City).
[For engravings, see "Illustrated Record," pages 196, 197.]

2. Galt, A., *Norfolk, Virginia.*—Sculptor.
A Bacchante, a head in marble.
Psyche, a head in marble.

3. Piatti, Antonio, *New York City.*—Sculptor.
Bust of Daniel Webster, in marble.
The Husbandman's Orphan, in marble, a nude figure of a boy leaning on a spade.
Sleeping child, in marble. [See "Illustrated Record," pages 13, 175.]

4. Hoppin, T. F., *Providence, Rhode Island.*—Sculptor.
The Sentinel, a mastiff in bronze. [Illustration in "Record," page 51.]

5. Brown, D. K., *New York City.*—Sculptor.
A female draped figure, in bronze, with one hand raised and the other pointing downward. ["Record," p. 113.]

6. Ball, T., *Boston, Massachusetts.*—Designer. Nichols, George W., *Boston, Massachusetts.*—Sculptor.
Statuette of Daniel Webster, in plaster. [This is a full-length figure, in the usual dress of the day, but modelled with remarkable life and accuracy.]

7. Muller, Charles, *New York.*—Sculptor.
The Minstrel's Curse, group in marble. ["Record," page 124.]

8. Criswell, William C. D., *Brooklyn, New York.*—Sculptor.
Christ in the sepulchre, in marble.

9. Kinney, B. D., *Worcester, Massachusetts.*—Sculptor.
Bust of Dr. John Green (of Columbia, South Carolina), in marble.
Bust of the Hon. Charles Allen, (of Worcester, Massachusetts,) marble.

10. Kinney, B. H., *Worcester, Massachusetts.*—Sculptor.
A collection of portraits in shell cameo.

11. Ives, C. B., *Connecticut.*—Sculptor.
Head of a female, in marble.

12. Jones, Thomas D., *New York City.*
Bust of General Taylor, in bronzed plaster.
Bust of General Cass.
Bust of General Scott.
Medallion portrait of Clay, in plaster.
Medallion portrait of Webster, in plaster.
Medallion portrait of Archbishop Hughes, in plaster.
Medallion portrait of T. A. Richards.

13. King, *Boston, Massachusetts.*—Sculptor.
Bust of Daniel Webster, in marble, property of Moses H. Grinnell, New York City

14. Moon, W. C., *New York City.*—Exhibitor.
A veiled Cupid, miniature in marble.

15. Boruss, G., *New York City.*
An allegorical bas-relief of the American Constitution, three figures with emblems, &c.

16. Ferris & Taber.—Sculptors.
Head of Jupiter, from the antique.
Statuettes, in marble, from the antique.

17. Renier, Peter, *Philadelphia, Pennsylvania.*
Bust of Wilson McCandless, in plaster.
Bust of Professor Mütter, in plaster.

18. Ellis, S., *New York City.*
Collection of medallions from life, in plaster.

19. Crawford, Thomas, *New York City.*
Bust of Mr. Crawford, in marble.

20. Gilbert, J. G., *New York City.*
Bust of Daniel Webster, bronze.

21. Kneeland, H., *Yorkshire, New York.*
Bust of Captain Erickson, plaster.

22. Duggan, Professor, *New York City.*
Bas-reliefs, in plaster.

23. Ryan, George, *New York City.*
Ornamental work, in marble.

GREAT BRITAIN AND IRELAND.

24. Marochetti, *London.*—Sculptor.
Colossal equestrian statue of Washington, in plaster, colored to look like bronze.

[This work, which was designed for a public square, has been found singularly deficient in all the requisites of high art. The horse is awkward and ungainly, with a gross contradiction between the movement of the fore and hind legs, a stiff neck, an equivocal tail, and not a quality about him but what would condemn a living horse at any market in Christendom. The figure is that of a raw recruit, at his third lesson, mightily pleased at getting on with it so cleverly. It is neither a work of ideal art, nor an accurate imitation of nature, though it might not be without its use to young students, as an illustration of what an equestrian statue ought not to be.]

[See "Illustrated Record," page 25.]

25. Bandel, Ernest, *London.*—Sculptor.
Cupid, marble.

26. Nannetti, Gianomo, *Dublin.*
Venus, a cast in plaster, full size of life.
Virgin and Child, full-length figure in plaster, size of life.
Diana Robing, full-length figure in plaster, size of life.

27. Marshall, W. C., *London.*
Sabrina, size of life, in plaster.

[The subject of this graceful figure is from Milton's Comus. The nymph is seated, with her right hand and head raised, in the act of listening, as if the first words of the invocation had just struck her ear.]

A "Tamburina," a full-length figure in plaster, size of life.

28. Lawlor, John, *London.*
The Emigrant, a female figure, in plaster, size of life. ["Record," page 48.]

29. Farrell, James T., *Dublin.*
The Hunter Reposing, full-length figure seated, in plaster, size of life.

30. Carew, *London.*
Statue of Webster, in Caen-stone. [Probably the worst thing in the Exhibition.]

31. Bandel, E., *London.*—Sculptor.
Charity, a female figure seated with an infant in her arms, marble, size of life.

32. Munroe, Alexander, *London.*
Francesca de Romini and her lover, a plastic group from Dante's Divina Comedia.

33. Jones, W. L., *London.*
Ptolemy Lagus fed by an Eagle, plaster.

34. Jones, J. E., *London.*
Seven busts, in plaster.

35. Kirk, Joseph R., *Dublin.*
Olivia raising the Veil. (Twelfth Night. Act I., Scene V.)

36. Shenton, Miss Ellen, *London.*
The Light of the Harem, model in plaster.

37. Hogan, John, *Dublin.*
Bust of Daniel O'Connell, marble.
Bust of Rev. Theobald Mathew, marble.

38. Durham, J., F. S. A., *London.*
Bust of Jenny Lind, marble.

39. Marshall, W. C., *London.*
The First Whisper of Love, two figures, Cupid whispering into the ear of a young girl. ["Record," page 27.]

40. Sharp, Thomas, *London.*—Sculptor.
Bust of Palmerston, marble.
Portrait-bust of a boy.
David returning Thanks for his Victory over Goliah.
Statue in marble.
Wellington's Entry into Madrid, model in soap.
Eve seeing her Shadow in the Water, plaster.
Time watching the Revolutions of Day and Night, design for a clock-case.
[See "Record," page 27.]

41. Jones, E. J., *London.*
Statuette of William Dargan.

42. Moore, Christopher, *London.*
Three busts in marble, and one in plaster.

43. Donnel, F. E. (a deaf-mute), *Dublin.*
The First-born.

44. Kirk, Joseph R., *Dublin.*
Ruth and Naomi, in marble.

45. Ryan, E. H., *Dublin.*
Lion, in plaster.
The Triumph of Alexander, plaster.

FRANCE.

46. A. Otten, *Paris.*—Sculptor.
Combat with a Serpent, a group in bronze.

47. Lechesne, *Paris.*—Sculptor.
Child attacked by a Vulture, and clinging to the Body of its Shipwrecked Mother, group in plaster.

48. Fremiet, E., *Paris.*—Sculptor.
Bear and Hunter in the Death-struggle, group in plaster.

49. Deumier, Madame, *Paris.*—Sculptor.
Bust of Louis Napoleon, marble.

50. ——— ———, *Paris.*—Sculptor.
Bust of Cerito, marble.

51. Huguenin, *Paris.*—Sculptor.
Virgin and Child.

52. Aubenel, J., *Paris.*—Sculptor.
Eagles, a group in bronze

53. D'Angiers, David, *Paris.*—Sculptor.
Statue of Racine, in marble.

54. L'Evêque, *Paris.*—Sculptor.
Lesbia, full-length figure in marble. [See "Record," page 164.]

55. Olten, *Paris.*—Sculptor.
A bas-relief.

56. Etex, *Paris.*—Sculptor.
Damalis, statue in marble.

BELGIUM.

57. De Bockeleer, *Antwerp.*—Sculptor.
Veiled head.
A Sleeping Cupid.
Psyche Reposing.
Bust of Prayer.

58. Fraikin, C. A., *Brussels.*—Sculptor.
Statue of Venus and Cupid.

59. Geess, *Brussels.*—Sculptor.
Two Children Sleeping, group in marble.

60. Weiner, *Brussels.*—Sculptor.
Bas-relief and medallions in bronze.

THE ZOLLVEREIN AND GERMANY.

61. Kiss, *Berlin.*—Sculptor.
The Amazon, in bronzed metal. ["Record," page 14.]

62. Geiss, *Berlin.*—Brass-founder.
Hebe, from Canova.
Niobe, from the antique
Adoration, copy.
Eve, by Bailey.
Hope, by Thorwaldsen.
The Basket-carrier.
Group of Goy and Girl with Dogs.
The above are all from the celebrated foundry of Geiss.

63. Franz, Julius, *Berlin.*—Sculptor.
Shepherd attacked by a Leopardess, in bronze, from the foundry of Geiss. ["Record," page 112.]

64. Vollgold, Theodore, *Breslau.*—Sculptor.
The Pet Parrot, in bronze.

65. Lazzerini, C., *residing at Rome.*—Sculptor.
Hebe, from Canova.

66. Bariata, Carlo, *residing at Rome.*—Sculptor.
A Danaide, marble.
Head of an Amazon, from the antique.
Bust of Queen Victoria.

67. Steinhauser, Carl.—Sculptor.
Colossal head of Christ, in gray stone.
The Fisherman's Daughter.

THE ITALIAN STATES.

68. Cartei, Luigi, *Florence.*—Sculptor.
Marble bust of Iris.

69. Caselli, Luigi, *Florence.*—Sculptor.
Hagar and Ishmael in the Desert, group in marble. ["Record," page 92.]

70. Farnucci, Luigi, *Florence.*—Sculptor
Bust of Lord Palmerston, marble.

71. Santarelli, Emilio, *Florence.*—Sculptor.
Harpocrates (the god of silence), full-length figure in marble.
Cupid in a Mischievous Mood, marble. ["Record," page 144.]

72. Cambi, Ulisse, *Florence.*—Sculptor.
Statue of "Truth."
A tipsy Bacchus.
Virgin of the Eucharist, a bas-relief.

73. Romanelli, Pasquale, *Florence.*—Sculptor.
The Betrothed, a bust. ["Record," page 196.]
The Son of William Tell.

74. Consani, Vincenzo, *Florence.*—Sculptor.
The Genius of Sacred Music.
Bust of "Laura."

75. Dupré, Giovanni, *Florence.*—Sculptor.
The Sleep of Innocence, in marble.

76. Magi, Luigi, *Florence.*—Sculptor.
John the Baptist Sleeping, in marble. ["Record," page 77.]

77. Giampaoli, Domenico, *Lucca.*
The Death of Ferruccio, statuette in marble.

78. Vincenti, F., *Lucca.*—Sculptor.
Genius of Death, a cast in plaster.

79. Vassé, Enrico, *Florence.*—Sculptor.
"Rebecca."
Faithful Love.
The Child's First Grief.
Bust of Cleopatra.
Bust of Heloise.

80. Strazza, Giovanni, *Rome.*—Sculptor.
The Mendicant, in marble.

81. Bienaimé, Angelo, *Rome.*—Sculptor.
Shepherdess and Bird, statue in marble.

82. Ladoureur, Chevalier, *Rome.*—Sculptor.
Virgin and Child, a bas-relief in marble.

83. Bienaimé, Luigi, *Rome.*—Sculptor.
The Guardian Angel, in marble. ["Record," page 110.]
Psyche Sorrowing, in marble.

84. Stocchi, Achille, *Rome.*—Sculptor.
Cupid leaning on a Wine-skin, statuette in marble.

85. Imhof, Enrico M., *Rome.*—Sculptor.
Virgin and Child, marble bas-relief.

86. Jericuau, A. (of Copenhagen), *Rome.*—Sculptor.
Cupid with the Arms of Mars.
The Sacrifice of a Goat, a bas-relief.
Three Female Dancers, a bas-relief.

87. Staffetti, Del Medico, Brothers, *Carrara.*—Sculptors.
Marble statue of Columbus, from an original model, by Signor Costa, of Florence.

88. Pelliccia, Ferdinando, *Carrara.*—Sculptor.
A Bacchante.
A Nymph wreathing Herself with Flowers.
The Genius of Summer.
The Genius of Spring.
Herminia writing the Name of Tancred.
Poetry.

89. Fabbricotti, Giuseppe Antonio, *Carrara.*—Sculptor.
Cupid and Psyche, copy from the antique, in the capitol at Rome.
Venus, of the Louvre, in marble.

90. Zaccagna, F., *Carrara.*—Sculptor.
Two bas-reliefs of flowers, in marble; and two statuettes of a dog and lamb.

91. Baratta, Eugenio, *Carrara.*—Sculptor.
The Flora of the Capitol.
Bartolini's Faith.
The Dying Gladiator, reduced from the antique.
Bust of the Saviour.
St. John the Baptist.
Bust of Rousseau.—Copies of all in marble.

92. Tenerani, Francesco, *Carrara.*—Sculptor.
Pope Pius IX., marble bust; copy from Pietro Tenerani.

93. Bienaimé, Pietro, *Carrara.*—Sculptor.
Ganymede and the Eagle; a copy from Thorwaldsen. ["Record," page 18.]
A Bacchante. Both in marble.

94. Lazzerini, Tommaso, *Carrara.*—Sculptor.
Salver with reliefs, copied from Benvenuto Cellini.
Two Lovers going to the Fountain, after a model by Henschel. ["Record," page 165.]
Hebe, copy from Canova.
Mercury, copy from Thorwaldsen. All in marble.

95. Bogazzi, Ercole, *Carrara.*—Sculptor.
Bust of Washington, marble.

96. Marchetti, Nicola, *Carrara.*—Sculptor.
Copy of the Warwick Vase, on sculptured pedestal. ["Record," page 91.]
Copy of the Flora of the Capitol.
The Pet Bird.
Bust of the Apollo Belvidere.
Bust of Copernicus.
Copy of the Diana of the Louvre.
Bust of Dante.
Bust of Jupiter, from the antique.
Bust of Shakspeare.
Statue of a Madonna.
Faith, after Bartolini.

97. Fontana, Pietro, *Carrara.*—Sculptor.
Statue of Marcus Tullius Cicero.
Bust of Paris. Both in marble.

98. Orlandi, Gerolamo, *Carrara.*—Sculptor.
The Shepherdess and Lamb.
The Struggle for the Heart, from the designs of Fiammingo.

99. Bauneri, Angelo, *Turin.*—Sculptor.
Ceres, after the antique.
Venus, after Canova.
Child with a Bird, after the antique.
Psyche.
Poetry.
Bust of Vincenzo Gioberto.—All in marble.

100. Augero, Amedeo, *Turin.*—Sculptor.
The Virgin mourning over the Dead Body of Christ.

101. Frumento, Giovanna Baptista, *Genoa.*—Sculptor.
Statuette (in plaster) of Ceres.
Statuette of Flora.

102. Galeazzi, Gaspare, *Turin.*—Sculptor.
Bust of the Virgin.
The Angel of the Annunciation.—Both in marble.

103. Cauda, Luigi.—Sculptor.
Busts of a boy and girl, marble.

104. Bonaniti, Edoardo, *Turin.*—Sculptor.
John the Baptist, a bas-relief in marble.

105. Bollo, Giovanni Battista C., *Genoa.*—Sculptor.
Military trophy, in statuary marble.

THE AUSTRIAN EMPIRE.

106. Pagani, Pietro, *Milan.*—Sculptor.
Eve after the Fall, statue in marble. ["Record," page 82.]

107. Kaciszmann, Professor, *Vienna.*—Sculptor.
Hebe offering Nectar to the Eagle, copy from Thorwaldsen.
Girl wreathing herself with Flowers.
Shepherd.

108. Croff, Giuseppe, *Milan.*—Sculptor
Boy riding on a Crawfish.
Boy riding on a Tortoise.
Leda with the Swan.
Statue of Innocence.
A veiled head.

109. Negeo, Pietro del, *Milan.*—Sculptor.
Virgin Grieving, marble bust.

110. Fraccaroli, Innocenzo, *Milan.*—Sculptor.
Atala and Chactas.
Colossal bust of the Redeemer.

111. Galli, Antonio, *Milan.*—Sculptor.
The Infant Saviour.
Child on the Waves.
Statue of Prayer.

112. Micotti, Ignazio, *Milan.*—Sculptor.
Lady of Chiozza, bust in marble.

113. Galli, Attilio, *Milan.*—Sculptor.
Basket of flowers.
Bas-relief of flowers.

114. Magni, Pietro, *Milan.*—Sculptor.
The Child's First Steps.
The Industrious Little Girl.

115. Motelli, Gartano, *Milan.*—Sculptor.
The Deserted.
The Veiled Head.
Cupid found among the Roses.
Nest of Cupids.
Cage of Cupids.
Basket of Cupids.
The Little Fisher-boy.

116. Puttinati, Alessandro, *Milan.*—Sculptor.
Virgin and Child, bas-relief in marble.

117. Rados, Giuseppe, *Milan.*—Sculptor.
A sleeping Venus.
A veiled head.

118. Rossi, Alessandro, *Milan.*—Sculptor.
"Religious Meditation," bust in marble.

119. Sangiorgio, Cav. Abbondio, *Milan.*—Sculptor.
Head of the Saviour.
Colossal bust of Vincenzo Monti.—Both in marble.

120. Tantardini, Antonio, *Milan.*—Sculptor.
"Resignation," in marble.

121. Jorini, Luigi, *Milan.*—Sculptor.
The Soldier's Son, in marble.

122. Cocchi, Luigi, *Milan.*—Sculptor.
The Fisher Boy, in marble.

123. Gasser, Hans, *Vienna.*—Sculptor.
Venus stepping into the Bath, bronze statue.

HOLLAND.

124. Leverman, J. B., *Doesburgh.*—Sculptor.
The Serpent in the Lion's Den, group in stone.

125. Schultz, L., *Zeyst.*—Sculptor.
Stag and two Wolves, in bronzed zinc.

126. Eindhoven, J. J., *The Hague.*—Sculptor.
William II. (late King of the Netherlands), bronze bust.

127. Stracke, F., *Arnhem.*—Sculptor.
Statue of St. Josephus, carved in wood.

PAINTINGS.

The whole number of paintings in the Exhibition, including those contributed by the Water Color Society of New York, was six hundred and seventy-five. By far the greater proportion of these were contributed by Europeans or their agents, American art being very scantily and imperfectly represented. Unfortunately, too, they were not of a kind to add much to our knowledge of art, many of them scarcely rising even to mediocrity. The landscapes were the most numerous, and, with three or four exceptions, the best. It would be difficult, however, to select even from this large class a single work of unquestionable superiority, although it may be said, with equal truth, that there were no instances in it of such grievous deficiencies as were abundantly displayed in the attempts at historical painting.

From this somewhat sweeping condemnation, we must except the contributions of the school of Düsseldorff, most of which were easily distinguished by their accurate drawing and faithful delineation of nature. The "Deputation to the City Council" would command attention in any place, both as a work of art and as an historical record. Eighteen hundred and forty-eight saw many of these scenes, in which the ruler was brought, for the first time, face to face with the people. In the picture, the members of the Council are seated, with a happy variety of attitude and expression, around the table of the council-hall. Through the open window, you look out upon a public square, where a popular orator is seen haranguing the promiscuous and excited crowd. At the door of the hall stands the deputation, the leader somewhat in advance, with an air and attitude of earnest conviction, while the different characteristics of such a rising of the masses are finely portrayed in the features and bearing of his colleague. Indeed, no part of the piece displays more strikingly the skillful discrimination of the artist. The leader is bold, self-possessed, and sincere. Just behind, is a man with a reckless swaggering air, twisting his beard with his fingers. The rum-bottle that peers from his pocket tells what kind of freedom it is that he asks for. The intermediate gradations of character and feeling are expressed with great felicity, and behind them all stands the wire-puller, with demagogue written all over him in unmistakable characteristics, whispering suggestions of excitement and impatience from his covert in the shadow of the door.

It can hardly be necessary to add, that the artistic management of the composition displays the profound study and happy appreciation of the laws of art which distinguish this eminent school—accurate drawing, judicious distribution of light and shade, and a minute elaboration of details, giving the highest finish to every part. The heads have the truthfulness of portraits, and some are painted so literally to the life that they stand out from the canvas, with an expression that almost startles you.

Hasenclever, the celebrated author of this piece, had three other works in the Exhibition, all of equal merit in their kind. Two of them were scenes from the *Jobsiad*, a German comic poem, the hero of which, Jeronimus Jobs, after failing as a student of theology, passes through various experiments upon life from a pedagogue to a night-watchman. Hasenclever gives two scenes from his experience, the school-room and the night-watch.

The third piece is a scene in a German inn, representing a party of peasants sharing their lottery prizes, and preparing for a great carousal.

Another piece of great merit as a composition, and though inferior in painting to "The Deputation," fully equal to it in grouping, was "Luther before the Diet of Worms," by A. Van Pelt.

No act of Luther's life was more characteristic of his bold spirit and firm convictions than his appearance before the Diet of Worms, on the 17th and 18th of April, 1521. To his friends, who, mindful of the conduct of the Council of Constance, had advised him not to go, he replied, "that he would go, even if there were as many devils in Worms as there were tiles on the housetops." On his approach to the city, the inhabitants hurried out to meet him in greater numbers than had come together for the solemn entrance of the Emperor. The hall of the Diet was filled, friends and enemies mixed up together. Charles was present, in the pomp of imperial majesty. Girolamo Aleandro represented the church as Papal Nuncio. Bishops, electors, and nobles, were ranged in the order of their dignity. The Chancellor of the Archbishop of Treves, John ab Eyk, acted as interrogator. Luther was introduced by Marshal Count Pappenheim, and told that he must simply answer the questions asked him, without entering into any discussion. From the thronged galleries, he could hear the voices of his friends, exhorting him not to fear those who can kill the body only, and mingled with these came the hisses and reproaches of his enemies. On the first day, he merely asked for time to answer the questions; on the second, the subject of this painting, he replied at length, closing with a firm and dignified admonition to the young Emperor not to act incautiously and hastily in this beginning of his reign. The orator of the Assembly told him, in severe terms, that he had not answered to the purpose, but must say, categorically, whether he would retract his opinions or not. In a few dignified words, he refused to retract anything, unless his conscience were subdued to the Word of God; and then added, in German, for thus far he had spoken in Latin, "Here I take my stand: I can do no other: God be my help. Amen."

One thing that deserves particular attention in his piece, is the manner in which the artist has spread out his crowd of actors and spectators upon the canvas, preserving at the same time the unity of the composition, and concentrating your attention upon the hero.

Among the contributions from Italy, the work most deserving of attention was "The Return of Regulus to Carthage."

The story which forms the subject of this piece is too well known to require repetition, but the painting calls for a few remarks, as one of the best specimens of the modern classic school in Italy. Cammuccini died about twelve years ago, at an advanced age, and sharing with Benvenuti, of Florence, the reputation of the greatest Italian painter of his time. His works are very numerous, almost all of them historical, and many of them upon subjects which, however unsuggestive they may seem to us, are still perfectly natural for a Roman. Most of his paintings from Roman history are widely known by engravings made under his own eye. His style is pure and correct, with a strong tendency to mannerism, particularly in the grouping of his figures and in the management of drapery. His drawing is accurate and fine, though not bold or free. In his earlier paintings the coloring was good, but in his later pieces he fell into an artificial style of contrasts, which is very disagreeable. In invention he displayed a fertility which would have given him a high rank, if there were more inspiration or spontaneity about it. But his groups recall other works somewhat too often, and his figures are evident elaborations of suggested ideas; yet, though not an original genius, Cammuccini was an artist of a high order, and his works will always hold an eminent place among the Italian paintings of the nineteenth century.