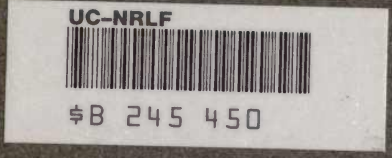
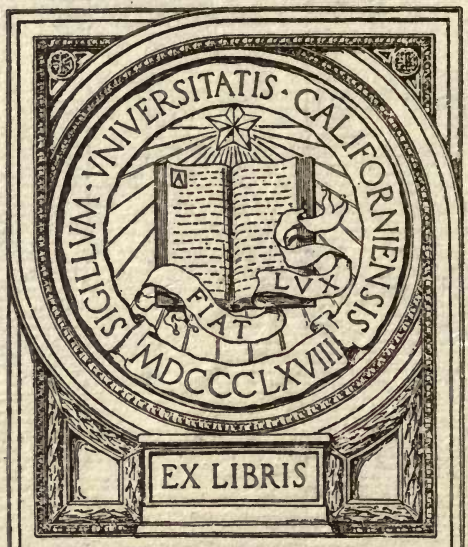


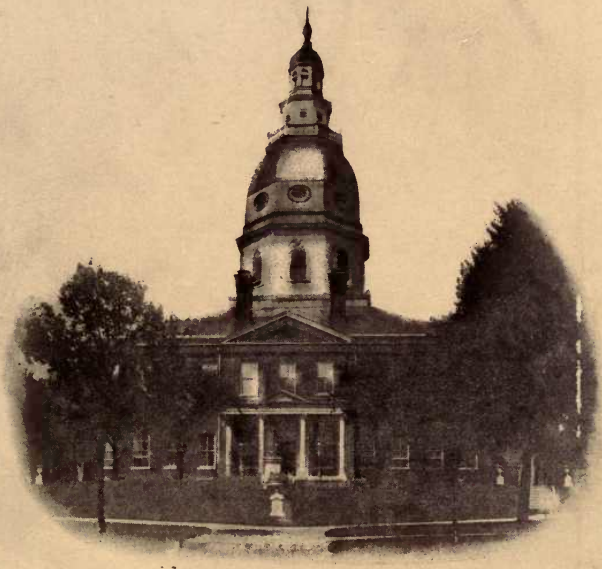


Guide to the

State Mineral Exhibit

Old Hall of Delegates

Annapolis, Md.



Installed by the

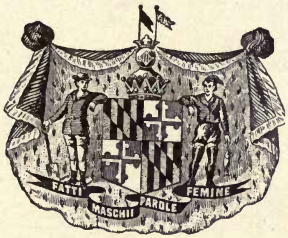
Maryland Geological Survey

MARYLAND GEOLOGICAL AND ECONOMIC SURVEY

GUIDE

TO THE

STATE MINERAL EXHIBIT



ILLUSTRATING THE
MINERAL RESOURCES AND INDUSTRIES
GEOLOGY AND
MODERN METHODS OF ROAD CONSTRUCTION

INSTALLED BY THE
MARYLAND GEOLOGICAL SURVEY
IN THE
OLD HALL OF DELEGATES
AT
ANNAPOLIS, MD.

BALTIMORE, 1912

The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

COMMISSION OF THE MARYLAND GEOLOGICAL SURVEY.

PHILLIPS LEE GOLDSBOROUGH, ... *President.*
Governor of Maryland.

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IRA REMSEN, ... *Executive Officer.*
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R. W. SILVESTER, ... *Secretary.*
President of the Maryland Agricultural College.

WM. BULLOCK CLARK, ... *State Geologist.*

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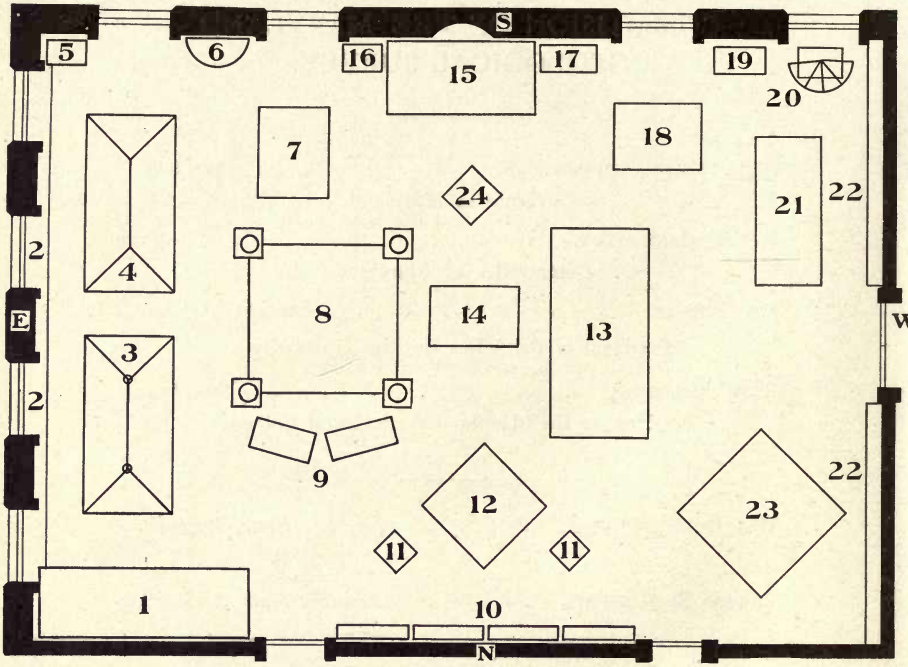
WALTER W. CROSBY, ... *Chief Engineer.*

EUGENE H. SAPP, ... *Curator.*



PLAN OF STATE MINERAL EXHIBIT.

1. Clay Exhibit.
2. Fireclay Products.
3. Brick-Tile Pavilion.
4. Slate Pavilion.
5. Earthenware Exhibit.
6. Publications.
7. Model of Baltimore.
8. Building Stone Pyramid.
9. Large Polished Boulders.
10. Exhibit Systematic Geology.
11. Mason-Dixon Line Monuments.
12. Ore Exhibit.
13. Pottery and Decorative Stone.
14. Model of Coal Fields.
15. Lime and Cement Exhibit.
16. Limestone Exhibit.
17. Silica Exhibit.
18. Feldspar and Flint Exhibit.
19. Feldspar and Flint Exhibit.
20. Road Views.
21. Soils, Marl and Highway Exhibit.
22. Road Sections.
23. Coal Pyramid.
24. Obelisk.

GUIDE TO THE STATE MINERAL EXHIBIT

INSTALLED AT ANNAPOLIS BY THE

MARYLAND GEOLOGICAL SURVEY.

History of Exhibit.

The materials forming the exhibit have been gradually collected by the Maryland Geological Survey over a period of several years, the nucleus being the Maryland Mineral Exhibit at Buffalo in 1901. This was largely added to in the preparation of the State's exhibit at Charleston the following winter and was still further increased in preparing the notable exhibit of Maryland's Mineral Resources for the Louisiana Purchase Exposition at St. Louis in 1904. A smaller exhibit was made for the Jamestown Exposition in 1907, and also incorporated. Altogether the exhibit is the most complete collection of Maryland mineral products that has ever been brought together.

The exhibits of the State's mineral wealth made by the Survey were remarkably successful in receiving the commendation of the juries of award at all of the expositions. At Buffalo the only gold medal awarded to any State for its collective exhibit of mineral resources was awarded to Maryland; at Charleston, among other awards it received 12 special gold medals, twice the number awarded any other State for mineral exhibits; and at St. Louis the exhibit as a whole received the grand prize, while parts of the display and individual exhibitors received 2 grand prizes, 8 gold, 23 silver and numerous bronze medals. It also received the highest award at Jamestown. Many of these medals together with the diplomas of award are displayed in the exhibit.

The various collections constituting the State Mineral Exhibit represent the diversified activities of the State and the Geological Survey, under whose auspices they have been installed. This organization was created by an Act of the Assembly of 1896 and

its scope has been enlarged by subsequent enactments. As at present organized the work is conducted by the State Geologist and his associates under the supervision of the Commission named on a preceding page.

The Survey is directly responsible for the work of investigating

VIEW OF A PORTION OF THE STATE MINERAL EXHIBIT AT ANNAPOLIS.

the various mineral deposits of the State and in the preparation and issuance of the maps and publications giving the results of these investigations. In co-operation with the different National bureaus it is rapidly completing the preparation of a series of large scale county maps which represent the topography and election districts, the geology, the agricultural soils, and the forest

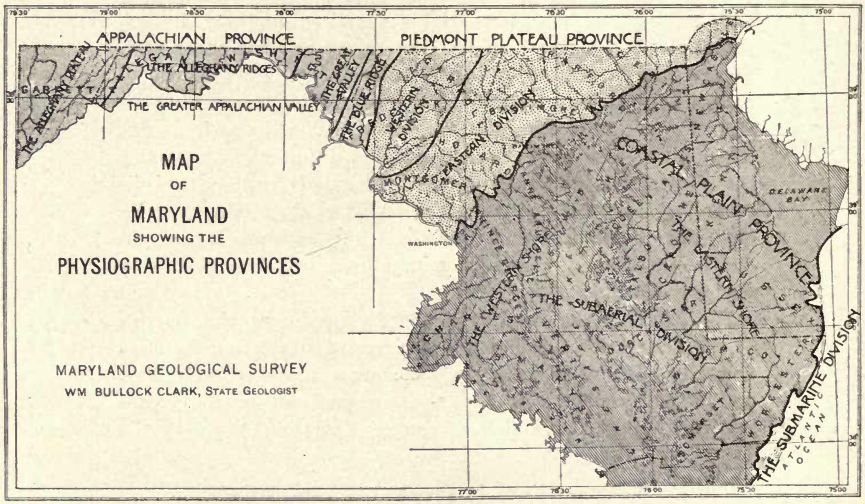
growth which will give to the people of the State detailed and accurate information regarding these various subjects. These maps are accompanied by exhaustive reports on the physical features of each of the counties. Each report includes discussions of the physiography or surface configuration, the geology and mineral resources, the agricultural soils and the crops best adapted to them, the climatology or weather conditions, the hydrography and water-power, the terrestrial magnetism, and the forestry resources. Besides these volumes the Survey also has under preparation various reports on special subjects, and elaborate publications have already been issued on the building stones, the clays and clay products, the coals, the limestones, and the iron ores. The Survey also serves as a bureau of information regarding the mineral wealth of the State and annually collects statistics regarding the value and amount of output of the mines, quarries, and other mineral industries. Since the organization of the Survey the annual output of mineral products has more than doubled in value.

For twelve years, from 1898 to 1910, the Survey had charge of the State road building and constructed nearly one hundred and fifty miles of highways at an expense of about one million and a half dollars. It has also prepared all of the State's mineral exhibits at expositions in recent years.

General Arrangement of the Collections.

The general arrangement of exhibits may be seen on the accompanying diagram. Toward the *east side* of the hall are the structural materials including the clay products, such as firebrick, terra cotta, tile and the different types of structural brick, slate, and the building and decorative stones. On the *west side* of the hall are the displays of pottery manufactured in Maryland and the various coals found in the State. On the *south side* are the agricultural soil types and certain special exhibits such as those of lime and cement, flint and feldspar, barytes, and silica (diatomaceous earth). On the *north side* are the iron and

copper ores. On the *walls* are instructive exhibits of the methods of road construction, several plate-glass cases containing a systematic collection of rocks, minerals and fossils found in Maryland, maps showing the distribution of certain physical features throughout the State and numerous special maps, pictures and transparencies illustrating the work of the Maryland Geological Survey.



MAP OF MARYLAND SHOWING THE PHYSIOGRAPHIC PROVINCES.

LARGE GENERAL WALL MAPS.

On the north and west walls, above the other exhibits, are three large maps of Maryland, 7x12 feet in size, which show many of the characteristic physical features of the State. They represent respectively the Physiographic Provinces, the Relative Elevations and the Geology and Agricultural Soils. Much information appears upon them which might be easily overlooked, and some of this, which can be readily derived from the maps, is presented in the following paragraphs.

MAP SHOWING PHYSIOGRAPHIC PROVINCES.

This map shows that Maryland forms a portion of the Atlantic slope, which stretches from the crest of the Alleghanies to the sea, and furthermore that the State is divisible into three more or less sharply defined regions known as the Coastal Plain, corresponding to Eastern and Southern Maryland; the Piedmont Plateau corresponding to Central and Northern Maryland; and the Appalachian Region corresponding to Western Maryland. Each of these divisions has particular characteristics which have their influence on the mineral and agricultural industries, and consequently intimately affect the welfare of the people.

The Coastal Plain includes the low, partially-submerged surface extending from the line of the Baltimore and Ohio Railroad to the edge of the continental shelf, about 50 miles off the shore of Worcester County. It consists of two divisions, the submarine division to the east of the present ocean border, at times in the past epochs forming part of the land area, and the subaërial division, or land portion, which is divided by the Chesapeake Bay into the Eastern Shore and the Western Shore. The Coastal Plain differs from the other provinces of the State in its nearly level surface configuration, and its marine and brackish estuaries. On the Eastern Shore it is generally low, the greater portion of the country being less than 25 feet above sea level, elevations of 100 feet and more being rare and confined to the northern part of the district. Its rivers of estuarine character are broad and navigable for long distances until they pass abruptly into insignificant sluggish streams. On the Western Shore the same conditions hold true except that the land is higher, in places exceeding 250 feet in elevation, and the surface of the country correspondingly rougher. Throughout the entire Coastal Plain several terraces may be recognized rising from one level expanse to another. These represent stages in the later geological history of Maryland and were formed by the action of waves working on the soft materials in much the same way as they are at the present time acting on the low cliffs along the Chesapeake Bay shore and the smaller estuaries.

The Piedmont Plateau is a low-lying country of complex origin whose rolling surface is traversed by highlands and cut by valleys which often trench the upland as deep gorges. It is divided into an eastern division and a western division by the inter-stream elevation known as Parr's Ridge, which, passing from western

VIEW OF A PORTION OF THE STATE MINERAL EXHIBIT AT ANNAPOLIS.

Montgomery County across Howard and Carroll counties, rises to an elevation of over 1100 feet near the Pennsylvania line. A close study of this central portion of Maryland shows that the level-topped hills and broad stretches between the streams are remnants of old plains cut out of the high plateau that formerly stretched across the district from the Appalachians to the sea.

Four such plains may be recognized by patching together their present remnants. The history of this district has also left its impression on the inhabitants. The best farming lands lie either on the flat-topped ridges or on the richer but wetter flood-plains of the valleys, and here may be found the most prosperous agriculturalists. The trenching of the old plains has exposed the

VIEW OF RELIEF MODEL OF STATE, SHOWING ELEVATIONS.

underlying rocks and stimulated the quarrying of building stones. It has also determined the location of the highways, while the waters descending from the highlands to the valley bottoms have developed water-powers which have been utilized by the numerous small mills throughout the district.

The Appalachian Region, extending from the Piedmont Plateau on the east to beyond the western limits of the State, consists of a series of parallel mountain ranges separated by deep valleys.

As the map shows, this region may be divided into the following four natural divisions: the Blue Ridge on the east, followed by the Great Valley (Hagerstown Valley), the Alleghany Ridges from North Mountain to Big Savage Mountain, and the Alleghany Plateau from this point to the western limits of the State. These are but small segments of similar divisions which extend northward into Pennsylvania and southward across the Virginias into the South Atlantic States.

The accentuated surface features of the Appalachian Region have strongly influenced the life of the inhabitants. The obstacles to communication offered by successive parallel ridges delayed settlement and restricted the east and west lines of travel to the valleys of the Potomac in Maryland, the Susquehanna in Pennsylvania, and the James in Virginia. Even before the advent of the Europeans the Indians had adopted these same lines of travel, which are now utilized by the railroads, canals, and highways. The steepness of the mountain slopes limited the farming to the valleys, and lumbering and grazing to the mountains, while the presence of great beds of coal has been the cause of the development of large mining communities in the Georges Creek and Upper Potomac Valleys.

MAP SHOWING RELATIVE ELEVATIONS.

The large map showing the Relative Elevations of the different parts of the State represents in a different way the facts shown on the relief model of the State, a view of which is given on page 11. The increasing elevation is shown on the map by progressively deeper colors, the highest points being represented by the darkest colors. This map and the cut of the model show the great expanse of land below 100 feet on the Eastern Shore, the higher and more rugged character of Southern Maryland, where most of the surface outside the stream valleys is over 100 feet, the broad Plateau of Central Maryland lying between 500 and 1000 feet, the Blue Ridge and Catoctin mountains with their tops averaging nearly 2000 feet, the Alleghany Plateau of

Allegany and Garrett counties fully 2500 feet high, and the summits of Big Savage and Great Backbone mountains rising above 3000 feet.

MAP SHOWING GEOLOGICAL FORMATIONS AND AGRICULTURAL SOILS.

The large map on the wall over the glass cases and the new geological map of the State recently published give even more

VIEW OF A PORTION OF THE STATE MINERAL EXHIBIT AT ANNAPOLIS.

information regarding the physical features of the State than either of the foregoing maps, since all of the features depicted on the former are more or less directly the result of the differences in the underlying geological formations. The geological maps show by their different groupings of colors that there are funda-

mental differences between the rocks of the three physiographic provinces already described. Those of the Piedmont Plateau are the earliest and most crystalline, and include representatives of the oldest rocks known (Archean and Paleozoic) and many igneous rocks (granite, gabbro, diabase, etc.), over which are found in places early Mesozoic deposits. The rocks of the Appalachian Region are next in age and belong for the most part to the Paleozoic era, ranging from the Cambrian to the Permian. The Coastal Plain contains the youngest and least consolidated rocks, ranging in age from the later Mesozoic to the Recent.

The diversity of geological formations, fifty-six of which are shown on the more detailed and smaller map elsewhere in the exhibit, is unusual, no other State in the Union of similar area containing representatives of as many types as those occurring in Maryland. Moreover these formations range in age from the oldest to the youngest with but few breaks.

Maryland thus contains an epitome of the geological history of the earth. So far as this history relates to Maryland it may be summarized as follows:

During the earliest periods of which there is any record there probably existed in the Piedmont Region of Maryland a land area, with a series of low ridges or mountain chains, extending from near the Blue Ridge eastward beyond the present limits of land for some distance over what is now the Atlantic Ocean. A large but shallow sea extended westward along whose shores were sands and gravels similar to those of the present coasts. These became the Cambrian sandstones of the Blue Ridge and nearby areas. The shore-line probably was not straight and long arms of the sea may have extended northeasterly across the Piedmont in which were laid down sandstones and limestones the latter of which have now become the marbles of Baltimore and Howard counties. Certainly this was the case in the Great Valley, where the Shenandoah limestones carry fossils of great antiquity.

This great inland sea continued for eons, its shore-line shifting

from time to time, and its waters teeming with numberless forms of life whose remains may be found as fossils in the rocks today. The shifting of the shore-line, the change in the height of the land to the eastward, and the growth and death of millions

VIEW OF A PORTION OF THE STATE MINERAL EXHIBIT AT ANNAPOLIS.

of little animals are all told in the sandstones, shales, and limestones of Appalachian Maryland. With all the changes back and forth there was a gradual permanent shifting of the shore-line westward until in Carboniferous time there were only great swamps in Western Maryland in which were deposited thick beds of vegetable matter which became the great beds of coal that have been of such value to the people of the State. Finally,

toward the close of the Paleozoic era, the shore-line of this western sea passed beyond the limits of Western Maryland. Since then few if any deposits have been laid down in this area. Its subsequent history has been one of folding of the rocks into arches and basins as they are found to-day, and of the gradual wearing away of the uplifted land by the rains and running waters. During the progress of these events in the western part of the State similar changes were probably taking place to the eastward, but little is known of the incidents because the records have been obscured by later deposits. It is probable, however, that the Atlantic Ocean was working its way westward, for the red sandstones of Frederick and Montgomery counties record the fact that soon after the formation of the coal beds narrow estuaries of the Atlantic, not very different from the present Chesapeake Bay, extended for long distances along the foot of the Blue Ridge and to the eastward. At this time the entire region was a low plain extending from the Atlantic on the east westward as far as Cumberland and possibly beyond the limits of the State, although there are some indications that the waters of western Allegany and Garrett counties flowed westward and not to the Atlantic. Remnants of this old plain may still be seen in the tops of Parr's Ridge, Blue Ridge, Dan's and Big Savage mountains.

On this old surface were laid down the earliest deposits of the Coastal Plain. Time and again, owing to the seaward tilting of the land, the Atlantic has swept back over the border of the Piedmont Plateau, and more than once the land has been worn down to an almost featureless plain, with only here and there a ridge rising above its general level. Each change is recorded in the clays and sands of the Coastal Plain or in the surface features of different parts of the State.

The geological map, together with the samples and model, shows where the commercial beds of coal are to be looked for and gives to one who may read it a knowledge of the extent and something of the depth of the more important seams. It tells, when compared with the specimens in the collection, approxi-

mately where the different kinds of clay or building stone may be found and indicates where search should be made for quarry sites favorably located to transportation facilities and markets. The relation between the soils and the underlying formations

VIEW OF A PORTION OF THE STATE MINERAL EXHIBIT AT ANNAPOLIS.

makes it possible to gain similar information respecting the places where agricultural soils of desired types occur.

The scale of both geological maps is manifestly too small to indicate these facts in detail. This information is to be obtained from the large scale county maps and publications of the Maryland Geological Survey.

County Maps.

About the walls are numerous county maps prepared by the Survey to illustrate the topography and election districts, the agricultural soils, the geology, and the forest types of the different counties. These county maps and the publications can be obtained at small cost from the office of the Survey at the Johns Hopkins University.

Transparencies.

The beautiful transparencies in the different windows, colored in autumnal foliage, depict a few of the many picturesque features of Maryland scenery. Many of the subjects are taken from Western Maryland, where the relief is greatest and the scenes most striking. Equally attractive spots, with quieter lines and softer blending of woodland, hill and stream, may be found in the eastern and southern parts of the State. The circular transparencies represent the appearance of typical Maryland rocks when seen with the aid of a polarizing microscope.

Models.

The models of portions of Maryland territory are of interest since they represent two distinctly different types of surface. The largest model is that of Baltimore and vicinity, which is 6x4 feet and is on the scale of 4 inches to the mile. This particular model is unusual since there has been no exaggeration of the elevations. The slopes of the hills and the valleys are the same as they are in nature. This makes the model look very flat, but it emphasizes the error of the popular misconception regarding the roughness of the earth's surface.

The model of the coal fields of Garrett and Allegany counties seems more exact, but here the region is quite mountainous and the relative elevations have been made five times higher than they are in nature. This model is particularly instructive in illustrating how different geological formations resting one above another have been folded, bringing them to the surface in a succession of different outcrops. This is well shown in the

position of the coal beds which outcrop about the edges of the Georges Creek valley but are often buried at its center.

The model of Cecil County is also on an exaggerated vertical scale and represents the transition from the highlands of the Piedmont Plateau to the lowlands of the Coastal Plain.

Mineral Products.

Maryland, though relatively small in area, has a great variety of mineral products, chiefly non-metallic, which afford the basis for important commercial enterprises or give promise of prospective value. Many of these deposits have been worked since early Colonial days, especially the clays and iron ores; others, like the coal, have been the basis for important industries for more than half a century; while still others, such as the feldspar industry, are of relatively recent development. The annual output for these industries has been steadily on the increase, and few realize the magnitude of the local enterprises which reached in value $11,587,636 in 1910. The accompanying figure shows the relative values of the annual production in the different mineral industries.

VALUE OF THE ANNUAL OUTPUT OF MINERAL PRODUCTS, 1896-1910.

Year.	Coal and coke.	Stone.	Flint and feldspar.	Sand and gravel.	Lime and cement.
1896	$3,299,928	$457,764	*	*	$365,477
1897	3,363,996	458,811	*	*	286,441
1898	3,532,257	703,873	*	*	399,938
1899	3,667,056	636,547	*	*	372,322
1900	3,927,381	727 640	$33,420	*	421,745
1901	5,046,491	866,524	45,929	*	488 322
1902	5,579,869	1,113,854	83,236	*	487,597
1903	7,189,784	1,126,992	86,898	*	469,113
1904	6,940,739	1,160,676	98,867	$219,268	345 329
1905	6,941,882	1,409,053	75,552	436,828	393,741
1906	7,602,790	1,370,924	126,832	285,797	383,135
1907	8,035,772	1,555,415	92,503	268,048	334,316
1908	6,173,375	1,070,623	104,563	404,166	332,455
1909	5,591,148	1,146,793	86,663	193,757	482,445
1910	7,174,931	1,243,334	97,750	396,357	629,923

Year.	Clay and clay products.	Ores (gold, copper, iron mineral paint).	Mineral waters.	Miscellaneous (soapstone, talc, marl, silica, etc.).	Total.
1896	$1,595,055	$53,304	$58,339	$4,631	$5,834,498
1897	1,312,889	27,660	21,185	4,747	5,475,729
1898	1,254,860	18,862	29,779	4,531	5,944,150
1899	1,683,596	26,557	13,045	10,344	6,409,467
1900	1,714,234	67,429	36,849	10,845	6,939,543
1901	1,613,663	45,135	57,680	11,500	8,175,244
1902	1,915,417	61,826	45,100	5,500	9,282,339
1903	1,921,821	33,612	45,918	9,360	10,883,498
1904	1,886,277	25,421	44,320	5,850	10,726,747
1905	2,282,856	35,152	44,627	6,782	11,626,473
1906	2,178,617	15,624	58,334	21,416	12,043,469
1907	1,916,238	34,767	110,039	32,250	12,397,348
1908	1,472,481	37,758	75,858	23,700	9,694,929
1909	1,774,676	32,061	90,855	18,000	9,416,398
1910	1,898,674	38,743	102,371	5,543	11,587,636

BUILDING STONE PYRAMID.

The pyramid shows 56 cubes representing the most prominent building stones of the State. Each cube is 8 inches in diameter, with each of its six faces differently trimmed, effectively bringing out the possibilities of the stone. The tops represent the natural face of the rock, the front faces are polished and the sides are bush-hammered, pointed, or otherwise dressed to emphasize the quality and varying appearance of the stones. On one side of the pyramid are the granites, including the well-known products from Port Deposit, Woodstock, Guilford, Ellicott City, and Baltimore. Another side is devoted to the sandstones, including those from Baltimore, Carroll, Frederick, Montgomery, Washington, and Allegany counties. A third is devoted to the darker-colored serpentines, gabbros and trap rocks. A fourth side includes the white marbles from Baltimore County and the limestones from the western part of the State. Each side is supported by polished risers of Woodstock, Guilford and Port Deposit granite, and Baltimore gneiss. The whole is capped by a pyramid of polished Potomac marble from Washington Junction. At each corner stands a graceful polished column. One is of deep green

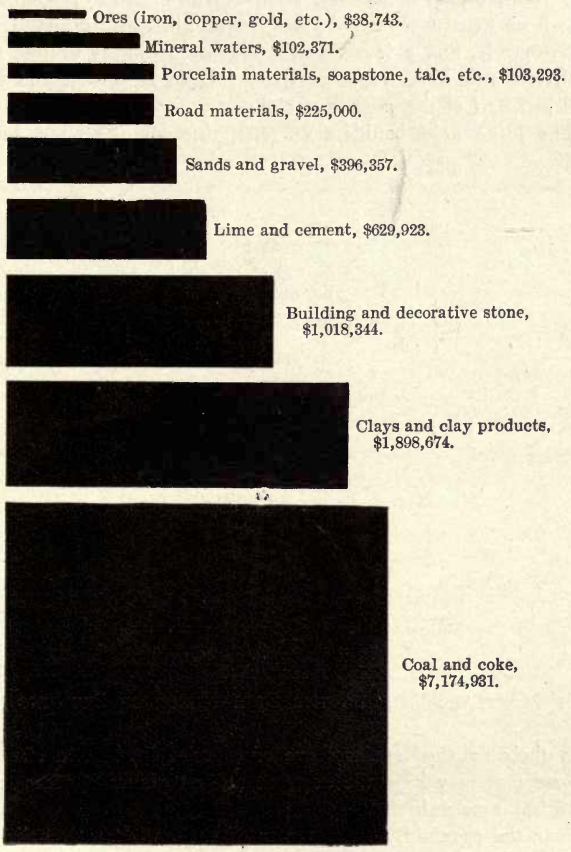
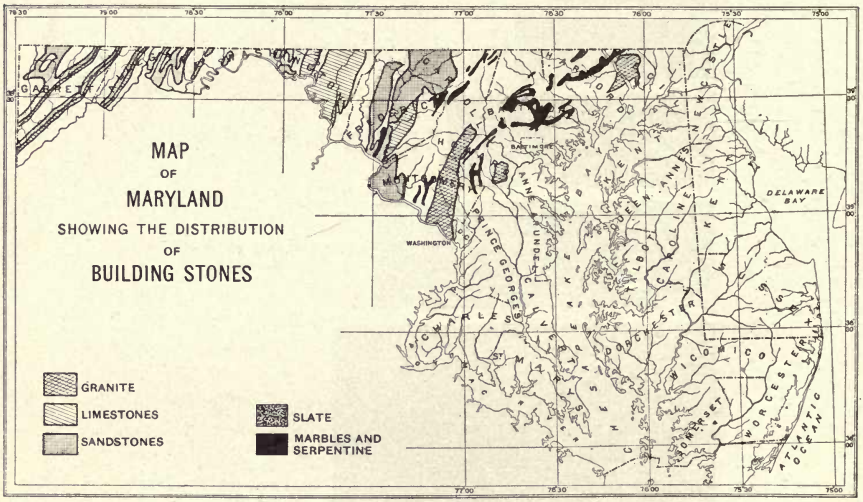


DIAGRAM SHOWING RELATIVE VALUE OF MARYLAND MINERAL PRODUCTS IN 1910.

serpentine, or *verde antique,* from Harford County; another of brown or Seneca sandstone; a third of glistening white Beaver Dam marble, and a fourth of the monumental gray granite from Guilford and Port Deposit. Each column is surmounted by a polished ball of the same material.

The large field boulders of serpentine and Potomac marble



MAP OF MARYLAND SHOWING THE DISTRIBUTION OF BUILDING STONES.

with their polished surfaces are of especial interest in showing the use that may be made of what at first glance appears to be worthless material.

Near the pyramid, in the center of the hall, is an obelisk of Potomac marble resting on a base of light gray sandstone, showing what can be accomplished by this method of treatment. Back of the central table in the niche is a column of serpentine from Baltimore County resting on a granite base from Port Deposit.

Additional specimens of decorative stone are exhibited in the large glass case in the center of the room.

The rocks of the State include many varieties of excellent building and decorative stones. The largest portion of the product is obtained from the Piedmont Plateau, or that part of the State lying north and west of Washington and Baltimore and east of the Blue Ridge. The central location of this area, traversed as it is by several railroads, places it within a convenient distance of the prominent Eastern cities. The rich variety of the rocks suitable for structural and decorative purposes is attested by the many beautiful specimens in this collection. The areal distribution of the more prominent types is given in the accompanying figure, and the principal features are described in the following paragraphs.

Granites. Granite is the broad family name that is applied to a large and common group of rocks which are usually of a somewhat mottled light gray color, and almost always carry the minerals quartz and feldspar as essential constituents. Besides these, which constitute the mass of the rock, there are dark-colored iron-bearing minerals such as black mica or biotite, hornblende, and occasionally pyroxene. Certain of the granites in which the constituents are arranged in roughly parallel lines, as well as certain other rocks with a similar banded arrangement of the same minerals, are called *gneiss.*

The regions in Maryland where granite and gneiss are most extensively worked are at Port Deposit in Cecil County, in the vicinity of Baltimore, at Woodstock or Granite in Baltimore County, and at Ellicott City and Guilford in Howard County. Specimens from each of these localities may be found in the collection. Other areas in Howard, Montgomery, and Frederick counties and in the District of Columbia contain some good stone, but this is quarried only for local use.

Marbles and Limestones. The marbles and limestones are more widely distributed throughout the State than the granites, occurring in larger or smaller areas in all the northern, central and western counties.

The marbles have long been known for their great value in building and monumental work, and have been utilized since the beginning of the last century. They are, with a single exception, confined to the highly crystalline rocks of the Piedmont

GENERAL VIEW OF EXHIBIT MADE BY THE SURVEY AT THE PAN-AMERICAN EXPOSITION, BUFFALO, 1901.

Plateau. Those which are being worked at present occur in Baltimore and Washington counties. The former is extensively used in building and decorative work, while the latter has only recently been put on the market as a decorative stone. Specimens of the former may be seen in the columns and cubes of the build-

ing stone pyramid, and slabs of the latter are displayed in the large glass case.

The Potomac marble, or "calico rock," is an interesting variety which is found at several places along the eastern slope of Catoctin Mountain, being quarried at Washington Junction. It is represented in the pyramid and in the small obelisk nearby, as well as by smaller specimens in the large glass case.

The serpentine or "verde antique marble" has been used as a decorative stone and is quarried in a small way in Harford and Baltimore counties, while other areas are found in Cecil, Howard, and Montgomery counties. That the stone is well suited to form beautiful columns and slabs is shown by the many specimens in the collection.

The limestones are confined to the western part of the State, where they have been quarried for local building purposes and for road metal and cements. These stones are usually of a deep blue color when freshly quarried, but upon exposure they gradually change to dove-gray, giving a most pleasing effect to the surfaces of the buildings.

Sandstones. Although there is but one sandstone within the State which has attained any considerable reputation as a building stone, there are many formations in different parts of the area which furnish suitable sandstones for local construction. As is the case with all building stones, the factor of transportation facilities is so important that only those materials can come into general use which are high class and favorably situated to prominent lines of travel either by rail or by boat.

Among the different sandstones the most important is that of the Triassic formations which is found in Montgomery, Frederick, and Carroll counties. This is the source of the red and brown sandstones used in many of the better class buildings in the cities. The stone is easily worked, suitable for delicate carving, of pleasing color and sufficiently permanent when properly used to withstand moderate exposure. The variations in color are shown by comparing the column from Seneca with the pedestal from Washington Junction.

Gabbro, Diabase, etc. Occasionally the darker-colored igneous rocks such as the coarse-grained gabbro and the finer-grained diabase are put on the market as "dark granites." The gabbro occurs in large areas in Cecil, Harford, Baltimore, and Howard

NEAR VIEW OF MINERAL EXHIBIT AT BUFFALO, 1901.

counties. The diabase occurs in the same counties as narrow dikes. In Frederick County, where it occurs in wide dikes and sheets, especially near the Pennsylvania border, it has been worked to some extent as "Gettysburg granite." The bright green epidote schist of the Blue Ridge might be worked as a decorative

stone, but up to the present time it has not been utilized. Specimen cubes of these various rocks may be seen on the pyramid.

SLATE PAVILION.

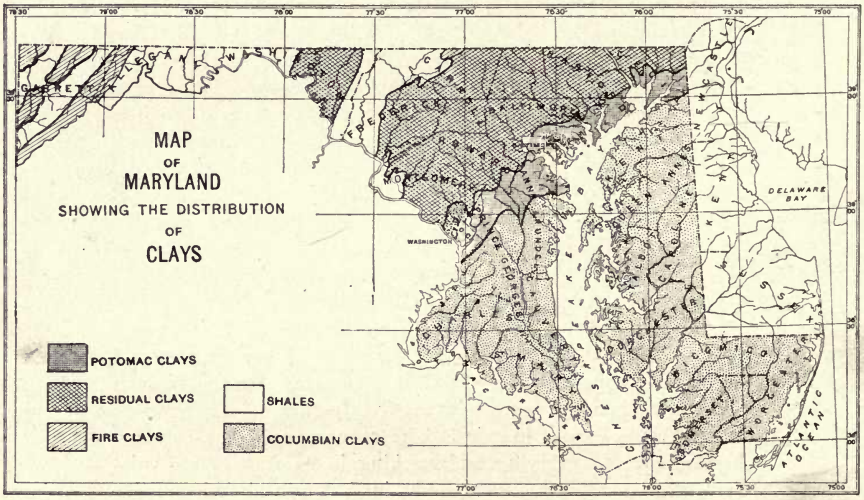
The slate pavilion is erected to display the well-known Peach Bottom slates manufactured along the Mason and Dixon line in Harford County, Maryland, and York County, Pennsylvania, where the slate beds form a ridge lying east and south of the town of Delta, Pennsylvania, and Cardiff, Maryland. The exhibit shows the large, irregular masses as they come from the quarry to the shed, the rough blocks into which the larger masses are broken and from which the roofing slates are split. The split slates are shown in their irregular shapes and when trimmed ready for the market. The slate rock does not differ chemically from many worthless shales and argillites, but the material has been recrystallized until the constituent particles are all arranged in parallel positions. It is this which gives the cleavage to the rock. The material is so strong and even-grained that it can be carved and sawed in spite of its cleavability.

The slates are particularly valuable because of their permanency of color. One may compare the sample taken from the old Slate Ridge church, where the slate was exposed to the weather for over one hundred years, with the freshly-quarried slates nearby and detect no change in color. The appearance of the quarries, the methods of quarrying and stacking in "ricks" before shipment are shown by the photographs in the booth and on the side wall near the corner. The method of laying roofing slates is well shown in the columns, where the slates of one course may be seen overlapped for a distance of two to three inches by the slates of the next but one course above. The unit of sale of slates is a "square" or enough slates to cover a hundred square feet when laid with a "lap" of 2½ to 3 inches. The number of pieces in a square varies with the size of the slate.

CLAYS AND CLAY PRODUCTS.

The table near the eastern entrance to the hall is devoted to selected samples of clays arranged according to their uses and the

geological age of the deposits in which they occur. Near the door are eighteen bottles containing samples of *fire-clay,* which is used in the manufacture of fire-brick, stove-linings, retorts and many other objects intended to withstand great heat. The term fire-clay does not indicate anything beyond the fact that the material does not fuse under 3000° F. Two types, represented



MAP OF MARYLAND SHOWING THE DISTRIBUTION OF CLAYS.

in the large blocks, are usually recognizable among the high-grade fire-clays of Western Maryland, namely, the plastic or soft fire-clay which develops moderate plasticity on grinding, especially after exposure to the weather, and the hard or flint clay which develops little or no plasticity on grinding. The clays occur together and are mixed in the different works at Mt. Savage and elsewhere. The fire-clays of the eastern part of the State are usually plastic, especially those of the Arundel formation. Examples

of many of the shapes of fire-brick made in Maryland are arranged beneath the windows along the east wall. The samples between the large blocks and the east end of the table represent many of the brick, terra cotta, sewer-pipe and pottery clays. The industry based upon these different clays in Maryland is one of the largest in the State, while the abundance of material is so great that these industries could be much more largely developed than they are at present.

The principal *terra cotta clays* are the buff-burning ones from the Arundel formation and the sandy or variegated clays of the Patuxent formation. From these, excellent terra cotta and roofing-tile are made, as is shown by the handsome specimens on the wall at the back of the table and on the roof of the adjacent pavilion. The uniformity of grain, pleasing color, and marked susceptibility to high-grade molding are well shown in the large model of the great seal of the State. The clays used in the manufacture of *sewer-pipe* are chiefly from the Arundel formation.

The *pottery clays* include the impure kaolins from Cecil County and the various clays from the Arundel, Patapsco, and Columbia formations. According to their varying character they may be used for white earthenware and porcelain, stoneware and yellow-ware, or for common red earthenware. The manufacture of pottery forms a most important branch of the Maryland clay-working industry, and their attractive products may be seen in different parts of the room, especially in the large case in the center of the hall.

Brick-clays are very abundant and well distributed throughout the State. They are found in all the clay-bearing formations of the Coastal Plain of Eastern Maryland, in the residual soils of the Piedmont Plateau throughout Central Maryland, and in the shaly deposits of the Appalachian Region of Western Maryland. The Columbia clay loams, on account of their grittiness and ferruginous character, are excellently adapted to the manufacture of common brick and are widely used in the vicinity of Baltimore. They have enough iron to burn to a good red color, sufficient quantity of fine particles to give the desired plasticity and enough

grit to prevent excessive shrinkage in burning. The Tertiary clays are less wide-spread, but are well suited to the manufacture of pressed or common brick. The clays of the Raritan formation are buff-burning and are well developed in Anne Arundel

GENERAL VIEW OF EXHIBIT MADE BY THE SURVEY AT THE SOUTH CAROLINA INTERSTATE AND WEST INDIAN EXPOSITION, CHARLESTON, 1902.

County, where they are worked extensively for pressed brick. The Patapsco formation consists essentially of variegated clays, which are well exposed near the water from Anne Arundel to Cecil counties. They occur in large bodies, are quite plastic and are well adapted to supplying the materials for large clay-work-

ing plants in common, or pressed brick, or terra cotta. The Arundel, or iron-ore clays, are abundant and excellently adapted for the making of both common and pressed brick. They are moderately siliceous, highly plastic, and sufficiently rich in iron to burn to a good red color. The Patuxent clays are usually either too sandy to make good common brick or not sufficiently refractory for making the higher grade fire-brick wares.

The residual clays of the Piedmont Plateau include the white kaolin deposits of Cecil and Harford counties and the impure residual clays which may be worked for common brick. These may be found overlying the granites, gabbros, serpentines, gneisses, shales, and limestones, and their character will vary somewhat according to the character of the underlying rocks. The gabbros yield highly plastic, deeply ferruginous clays; the granites, clays less plastic and less ferruginous; the Triassic sandstones, uneven, impure clays; and the limestones of the Frederick and Hagerstown valleys, medium to high grade residual brick-clays.

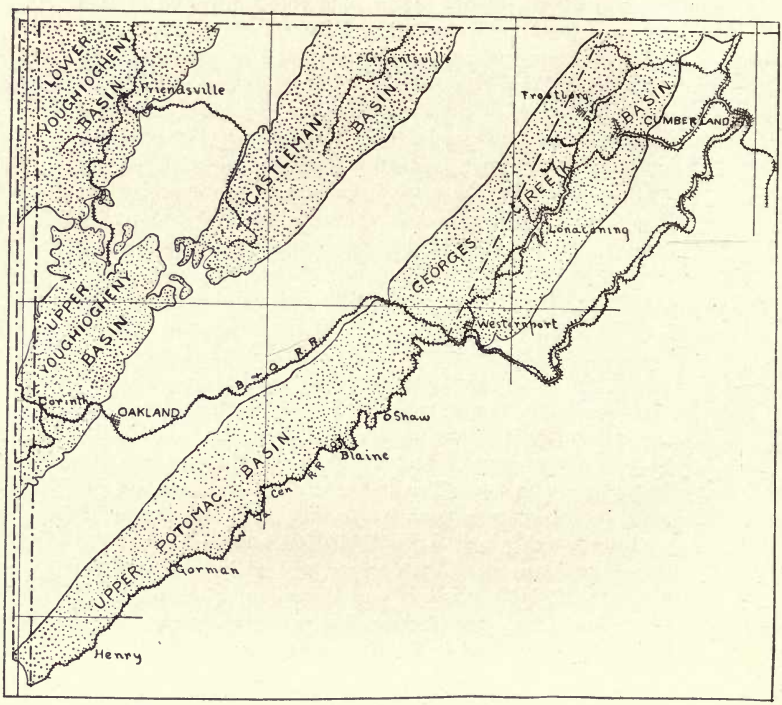
The Appalachian Region contains many shales; few of these, however, are likely to prove serviceable for the manufacture of brick or other clay products except in the case of the valuable fire-clays already discussed and the shales of the Jennings formation of Devonian age. The latter, while a trifle too siliceous and granular when fresh, upon weathering grind to a reasonably plastic mass which yields a good vitrified paving brick. The Tuscarora sandstone near Cumberland also yields the sand for the "lime-sand" brick which is now being put on the market.

The products from some of these different clays are represented in the pavilion described in the following paragraph.

BRICK AND TILE PAVILION.

This pavilion is constructed of different types of products from the plants of the various clay-working operators within the State. Of the six columns two are constructed of high-grade common brick from the works of the Baltimore Brick Company, two are of the light colored lime-sand brick from the Cumberland Granite Brick Company, and two are of face brick from the Washington

Hydraulic-Press Brick Company, whose materials are secured from Harmans, Anne Arundel County. The pavilion is floored with enameled brick from the works of Andrew Ramsay at Mt.



MAP SHOWING LOCATION OF MARYLAND COAL BASINS.

Savage, and with the different types of brick manufactured by the Washington Hydraulic-Press Brick Company, the latter separated by a few courses of lime-sand brick from Cumberland. The roof is covered with glazed roofing-tile from the Edwin Bennett Roofing Tile Works of Baltimore.

The transparencies hung in this pavilion represent the appearance of Maryland granite and diabase as seen in thin section under a polarizing microscope.

COAL PYRAMID.

Near the west entrance to the hall is a pyramid composed of coal cubes from the different mines, topped by a large pillar of coal from the mines of the Consolidation Coal Company. These specimens of coal have been sent by the more prominent operators now engaged in working the many beds of Maryland coal. There are over thirty different beds of coal which have been recognized as occurring in Maryland, but at the present time only seven or eight of these are worked for more than local demands. The coals of the State occur in five basins, as indicated in the accompanying map. Of these basins the most important is the Georges Creek, and the next in importance its southern continuation known as the Upper Potomac basin. The others are as yet practically undeveloped and supply only local demands. The principal mines of the Georges Creek basin are in the "Big Vein," or Pittsburg seam, although there is a rapidly-growing development in the use of the underlying "small veins." In the Upper Potomac basin the small deposits of "Big Vein" within the State have been exhausted, and all of the operations are now in the smaller veins, which in this basin cover a large area.

The Maryland coals are softer than anthracite and less volatile than the bituminous coals of Pennsylvania, and are accordingly known as semi-bituminous. They possess great value for steam and smithing purposes and are used extensively as fuel for locomotives, steamboats, and factories along the Atlantic coast.

ORE EXHIBIT.

Maryland is rich in mineral resources, but unlike many other States, her wealth does not lie in valuable ore deposits of precious or useful metals. These, however, are not lacking although only a few deposits have sustained profitable industries. The ore table

in the center of the hall includes exhibits of Maryland ores of iron and copper, and also of gold.

Ores of *iron* are found widely distributed in Maryland, the most extensive deposits thus far discovered being the brown hematite ore of Frederick and Carroll counties; the carbonate

BUILDING STONE EXHIBIT AT CHARLESTON, 1902.

ore of Prince George's, Anne Arundel, and Baltimore counties; and the red and brown hematites found in the Coal Measures of Western Maryland. The iron industries of the State started with local ores, but the discovery of extensive deposits elsewhere has practically stopped the mining of hematite ores within

the State. The high quality of the carbonate ores still makes it possible for them to compete with the cheaper materials from the South and West. The iron from the Muirkirk furnace is of exceptional quality, showing a tensile strength of 30,000 to 40,000 pounds to the square inch. The product of this plant was largely used by the United States Government in its manufacture of gun carriages and armor-piercing projectiles. Specimens of Colonial pig, modern pig, test pieces and the ore itself may be seen in the exhibit. The hematite ores from the Piedmont Plateau and Western Maryland are also well represented.

Ores of *copper* are found in the Piedmont Plateau and in the Blue Ridge. Those of the Piedmont evidently occur in a series of zones extending across Frederick and Carroll counties and about the Bare Hills, near Baltimore. In every instance they seem to be closely related to igneous rocks, though often occurring most abundantly in limestone, as at the well-known Liberty mines. Prior to the discovery of rich deposits in Michigan in 1844, and later in Montana and Arizona, Maryland was an important copper-producing State. At the present time there are no deposits within the State which are worked profitably.

Gold ore is found in Montgomery County. Some remarkably rich specimens have been obtained, but the gold is so unevenly distributed that it has never been worked with profit.

POTTERY AND DECORATIVE STONE EXHIBIT.

The large glass case near the western entrance is devoted to a display of Maryland *pottery* and *decorative stones*. The former is the product of two Baltimore potteries which rank among the best in the United States. The older of these is the Edwin Bennett Pottery Company, represented by the wares on the right hand side of the case on entering the hall. Among the pieces shown are high-grade dinner, tea, and toilet ware in American porcelain, jardinieres with colored glazes and many other forms, some with ornamentation in relief. This company built the first high-grade pottery plant south of the Mason and Dixon line. The younger pottery is that of D. F. Haynes & Son, known as the

Chesapeake Pottery. This firm has made many noted wares such as the "Clifton," "Avalon," "Calverton," and "Arundel." Their work is represented by parlor and banquet lamps, clocks, and large decorative vases, characterized by originality of design, grace of form, and delicacy of execution. Both firms have received awards of distinction at all the expositions.

The south end of the case contains polished slabs of Maryland decorative stones, among which may be noted the beautiful slabs from the recently developed quarries at Eakles Mills, in Washington County, and the "verde antique," or serpentine, from Harford County.

OTHER MATERIALS.

The table in the centre of the south wall and the two tables adjacent to it contain displays of miscellaneous products including limestones, shales, feldspar, flint, dry paints and mortar coloring, barytes, diatomaceous earth, agricultural soils and marls.

The *lime* and *cement* industries of the State are represented by limestones and shales of various kinds from several areas. The various changes in the process of the manufacture of Portland cement are shown by specimens of limestone and shale, the clinker formed by burning these together, and the finished Portland cement obtained by grinding the clinker. This important new industry is represented by extensive exhibits of the Tidewater Portland Cement Co., and the Security Cement and Lime Co. Specimens of the raw materials used for a flux in smelting or for agricultural and building lime may be seen beneath the table.

The *feldspar,* which is exhibited in large blocks, smaller samples, and pulverized to different grades of fineness, represents a small but interesting Maryland industry which is growing. The original mineral occurs in coarse-grained masses throughout the eastern part of the Piedmont Plateau, but is mined most extensively in Cecil County and along the valley of the Patapsco between Sykesville and Ellicott City. Two kinds of "spar" are distinguished, the potash and soda, and the product to be market-

able must be free from iron and other coloring impurities and relatively free from quartz. To get the material in this condition usually requires hand picking, although methods have been devised in Maryland for cleaning the product by machinery. Specimens from Henryton show what can be done in this way. The crude mineral is usually shipped to Trenton, New Jersey, or to Ohio, where it is ground and used in the manufacture of porcelain.

The *flint,* or quartz, has been successfully quarried in Cecil, Harford, and Baltimore counties. It is found in large vein-like masses of more than usual purity, which are represented in boulders along the south wall. It also occurs along the contact between granites and gneiss where original impurities have been removed and the rocks reduced to a white pulverulent quartz. The flint is reduced to a powder by grinding and this flint flour is shipped in bags to different points within and without the State. Different stages in the fineness of grinding are represented in the exhibit.

The *barytes,* which is found in the limestone, sometimes associated with the copper, is one of the heaviest of harmless white substances. It is sometimes ground and used as an adulterant of powdered sugar or white lead paint. It is not worked in the State at present.

The *diatomaceous earth,* tripoli, or silica, shown in large blocks and bottles at the end of the table consists almost exclusively of numberless skeletons of microscopic plant-forms known as diatoms. The largest of these are scarcely one-hundredth of an inch in diameter and most of them average less than one-fifth as large. In Anne Arundel, Calvert, and Charles counties there are beds which are 30 to 40 feet thick made up of these minute forms. The material is used in silver polishes, toothpowders, and soaps, where a delicate abrasive is desired, and it has also been used for coverings for steam-pipes and for dynamite cartridges. An assortment of dry paints and mortar coloring is represented in the exhibit on the same table.

The *agricultural soils* are selected to illustrate several types

from different parts of the State. Each type as it occurs is represented in the larger bottles, while the smaller bottles show the relative amounts of silt, fine sand, gravel, etc., which constitute the given soil. The finer soils are better suited to slow-growing

General View of Exhibit Made by the Survey at the Louisiana Purchase Exposition, St. Louis, 1904.

crops such as corn, wheat, and grass, the coarser and more open soils to short-term crops such as vegetables, fruits and berries. If the soils are too fine they pack to a hard clay; if too coarse they are hard to work and do not retain sufficient moisture for the crops.

The *marls,* represented by several typical samples, were formerly used extensively for enriching the soils, but in recent years they have been displaced by artificial fertilizers, which, while more expensive, yield a quicker return for the investment.

Collection of Systematic Geology.

The wall between the two entrances is devoted to four plate-glass cases containing a systematic collection of specimens of rocks, minerals, and fossils illustrating the different geological formations of the State, while below these are larger specimens of especial interest. Each of the four cases is devoted to one of the four major divisions of the geological history of the State.

On the left are the oldest rocks, representing what the geologists call the *Archean.* This period of the earth's history represents the time when the crust was being formed and the surface prepared for organic life. It covers a great interval of time, probably millions of years, and its chief representatives to-day are crystalline rocks of igneous origin such as the granites, gabbros, and serpentines, the ancient volcanic rocks of the Blue Ridge and the equally crystalline gneisses of Baltimore and vicinity.

The second case represents the *Paleozoic* era, or the time from the first extensive development of life, to the close of the Coal Measures. The fossils and rocks of this era are diversified and the specimens contained in the case are especially representative of the rocks and fossils found in Western Maryland.

The third case is devoted to the *Mesozoic* era, or the time after the formation of our coal beds, to the advent of considerable numbers of animal and plant forms closely related to those living to-day. The specimens in this case are especially representative of the red sandstones of Montgomery, Frederick, and Carroll counties, and the clay formations of northern Prince George's and Anne Arundel counties, and southern Baltimore, Harford, and Cecil counties.

The fourth case contains rocks and fossils of the *Cenozoic,* or

latest era, in which the animals and plants are progressively more and more like those living to-day, many of the fossil forms found in Maryland being ancestral types of the plants and animals now living in the State. The specimens in this case are especially representative of the counties of Southern Maryland

VIEW OF EXHIBIT LOOKING SOUTH AT ST. LOUIS, 1904.

and the Eastern Shore, which are so largely composed of unconsolidated sands, clays, and marls.

Beneath the cases a similar but less exact classification by age is followed. The tracks of animals and seaweed-like markings represent some of the oldest evidences of life found in the State; then the bones of huge reptiles which lived along the Maryland

bays. Farther to the right are the skulls and bones of whales, and the trunks of cypress trees which lived in Maryland long before the advent of man.

Mason and Dixon Line Monuments.

On either side of the ore exhibit near the entrances to the hall are stone monuments which were brought from the Isle of Portland, England, about 1765 for the marking of the boundaries of the State. For over seventy-five years the proprietors of Maryland, Pennsylvania, and Delaware had carried on a controversy regarding the boundaries between their possessions. The English courts had decided what the lines should be and local surveyors had attempted to lay these out on the ground without complete success. In 1763 the proprietors agreed to send over the noted surveyors Charles Mason and Jeremiah Dixon to complete the work. They arrived in Philadelphia in the fall of that year and were busy for four years in running and marking the various boundaries. They placed monuments like those in the collection along the entire Delaware-Maryland boundary and along the Maryland-Pennsylvania boundary as far west as Sideling Hill in Allegany County. Every fifth mile was marked with a "crown stone" bearing the arms of Lord Baltimore on the Maryland side and the arms of the Penns on the opposite side. The intermediate miles were marked by "milestones" on which were engraved the letters M pointing towards Maryland and P pointing towards Pennsylvania and Delaware. The northern line became famous in after years as the division line between the North and the South.

Highway Exhibit.

The highway exhibits of the Maryland Geological Survey comprise the materials on the table on the west side of the room, the revolving frame showing views of Maryland roads before and after improvement, and the model sections of different types of roads on the west wall of the hall.

The exhibits on the table represent by photographs and specimens the methods of making tests on road metals, paving bricks, cements, etc. The different road metals are tested as to their wearing power by subjecting the fragments to rubbing against each other in a "rattler" for a given length of time. The softer the rock the more the fragments are rounded and the more dust is formed. This dust is then tested for its cementing power to see whether the worn material on a road will harden after the rain or remain as a dust to be blown about by the wind. Paving bricks are tested in the same way to see how they will withstand the wear of horses' feet. Their strength is also tested to see how much of a load they will support without breaking. Cements are likewise tested to determine their relative strength and bonding power.

Specimens of different kinds of rock, brick, and cement are shown before and after the tests have been applied. The results of this work have been of the greatest service to all sections of the State in informing the authorities how to select the best materials for the different works of construction.

The views of Maryland roads give an excellent idea of the changes produced by modern construction. Many different types are shown in the revolving frame.

On the wall to the right of the entrance are six cases, each about 20 feet long, with glass fronts and tops. Five of these cases contain full-sized cross-sections of different kinds of roads built according to the best modern practice by the Maryland Geological Survey. The sixth case shows a cross-section of a road built under the old-fashioned method of simply spreading a large quantity of roughly-broken stone on an unprepared road-bed and then covering the same with sufficient dirt to induce and aid the travel to pack down this loose stone. The large amount of stone required, the unsatisfactory result and the imperfections of this method, as well as the reasons for the higher cost of maintenance of roads built in this manner, are easily seen by comparison with the sections in the other cases.

The top case to the left shows a properly constructed road of

General View of Exhibit Made by the Survey at the Jamestown Exposition, 1907.

gravel. The case underneath this shows how gravel or oyster shells may be used as a first course in those localities where stone is more expensive, and yet the amount of travel is sufficient to require a stone surface in order to save in annual maintenance. The bottom section to the left shows a road built of stone with an under-drain. The thickness of the stone in this section is 8 inches instead of the usual 6 inches, and, with the under-drain, shows about the extreme amount of stone used even on very soft and wet sub-grades. Under modern methods, were the sub-grade too poor to permit of permanent results from this form of construction, unless stone was unusually abundant and cheap, some other expedient would be used to improve the sub-grade rather than the use of more crushed stone.

The top section at the right shows a properly constructed shell road, built with the aid of a roller. The life of such a road should be considerably longer than that of a road made by simply dumping the shells on a flat surface and allowing the travel to consolidate them. In the latter instance the shells would taper out so thin at the sides as to be likely to cut through should a heavy load come on them at an inopportune time; and once the edges begin to break away the road rapidly goes to pieces. With a shell road built as shown in the case the sides are fully as capable of supporting a load as the center. Then, too, the shells under the roller assume generally a position with the flat sides and not the edges of the shells opposed to the travel; also the shells underneath the top inch or so are not as much broken up as they would be in being packed down under the traffic, with the result that the road becomes firmer and less subject to wear.

The middle section on the right shows the ordinary 6-inch macadam road as built under modern methods. The width of the "metal," which under the law may be stone, gravel, oyster shells, marl, or any "good material," is shown as 12 feet in all the sections, which is the standard adopted by the State, although this standard is departed from where allowable, if so requested by the county, the shell roads being often reduced to 9 feet and the stone roads occasionally built as wide as 14

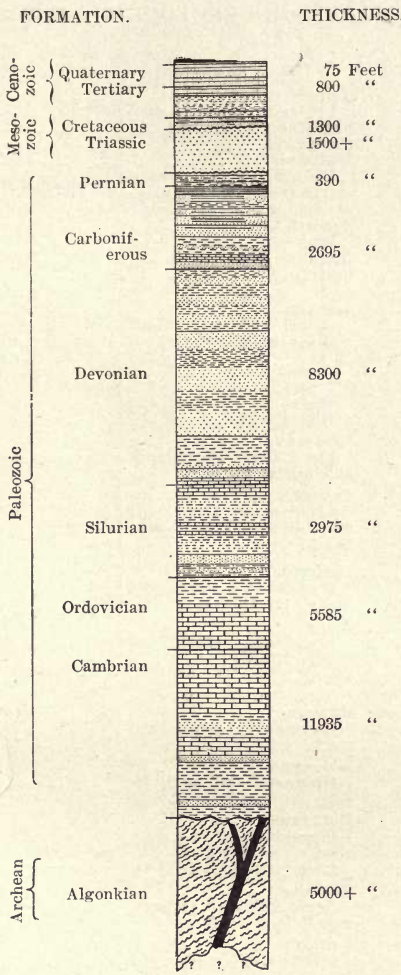
feet. The observer will notice how, under the action of the roller, the various particles of stone and gravel become wedged together and how much fewer unfilled chinks there are in the metalled portion of the road, and consequently how much less dirt there is in the metal to absorb moisture to the detriment of the metal surface in wet or freezing weather. Everyone knows that, in dry weather, a clay road may become hard, and as long as it is absolutely dry it will be almost impossible for any load to make an impression on it. The minute, however, it begins to absorb moisture it becomes soft and cuts up. Consequently, if the sub-grade under the stone or gravel or shells can be kept dry, the sub-grade should support without difficulty the stone layer and the load on top of it; and the "metal" itself, from its nature, will of course stand the effects of travel and wear better than even a dry sub-grade.

The sub-grade needs to be protected from water in two ways: first, from the water that falls on the surface, and second, from the water that tends to soak into it from the adjacent ground. In the lower left hand case it is seen how the water is drained out of the sub-grade by making the surface practically water-tight, and it will be readily seen by examining the several cases how much more nearly water-tight the stone surface built under modern methods is than the stone surface built under the old methods. All the little openings between the pieces of stone in the metalled portion become filled with stone chips and stone dust, and the surface does become actually water-proof, when built under modern methods. Under the old methods, however, so much dirt accumulates between the loosely-packed pieces of stone that the water readily finds its way down into the sub-grade, and the road ruts and cuts through and, as mentioned above, frost helps this process by expanding the mud between the pieces of stone when it solidifies, and driving still farther apart the stones themselves.

A still futher advantage of the modern methods will be noted in the position that the particles of stone themselves assume under the roller. Under the old methods, the stone lay loosely

packed in every position, often with points uppermost. Under the roller the stones naturally assume a position with flat sides uppermost, and it can be readily understood how much slower a stone will wear down if a flat side instead of an edge is subjected to wear.

The shape of the sections is an important consideration. The road built by the old method, from the form of its surface, collects the travel into ruts which tend to hold water to the detriment of the road, and unless the stone portion is made very wide, and consequently a large amount of stone is used, it frequently becomes quite difficult for teams to pass without turning sharply down over the edge of the stone onto the earth side-road. When properly built, as shown in the cases, it will be noted how readily the water is shed to the ditches, there to be carried off to the natural water courses away from the road, and how very easy it is for one team to pass another without the necessity of both teams, or even more than one set of wheels of one of the teams, leaving the metalled portion. The earth shoulders on the side of the metal are even with it and are, in the process of construction, thoroughly rolled. In but a short time they become so hardened from the stone dust that is washed down on them and from the growth of grass, weeds, etc., that they will support an ordinary load without any trouble, and the effective width of the travelled way is at least 18 feet, although only 12 feet of stone or gravel have been used.



GENERALIZED SECTION OF MARYLAND GEOLOGICAL FORMATIONS.

TABLE OF MARYLAND GEOLOGICAL FORMATIONS.

CENOZOIC.			
Quaternary.			
Recent.			
Pleistocene	Talbot Low-lying terrace composed of gravel, sand and clay; 25 ft.		
	Wicomico Medium level terrace, carrying boulders and gravel, sand and clay; 25 ft.		=Columbia Group.
	Sunderland High-lying terrace composed of loam, sand and gravel; 25 ft.		
Tertiary.			
Pliocene (?)	Lafayette Gravel and sand occurring at higher elevations; 30 ft.		
Miocene	St. Mary's Clays, sandy clays and marls; 150 ft.		
	Choptank Clays, sandy clays, sands and marls; 125 ft.		=Chesapeake Group.
	Calvert Clays, sandy clays, marls and diatomaceous earth; 200 ft.		
Eocene	Nanjemoy Greensands, clays and sands; 125 ft.		
	Aquia Greensands, sands and marls; 175 ft.		=Pamunkey Group.
MESOZOIC.			
Cretaceous.			
Upper Cretaceous	Rancocas Greensands, sands and marls.		
	Monmouth Greensand and sand, locally indurated; 75 ft.		
	Matawan Greenish-black, sandy clay, containing green concretions and lignite; 100 ft.		
	Magothy Sands with dark carbonaceous clays; 50 ft.		
	Raritan Interbedded sands and clays; 400 ft.		

Lower Cretaceous..	Patapsco Variegated clays; 200 ft. Arundel Interbedded clays with iron ores; 125 ft. Patuxent Interbedded sands and clays; 350 ft.	=Potomac Group.
Triassic	Newark Red and gray sandstones and shales with diabase.	
PALEOZOIC.		
Permian	Dunkard Thin shales and limestones with coal; 390 ft.	=Coal Measures.
Carboniferous. Pennsylvanian	Monongahela Black shales, sandstones, and 14 ft. coal seam; 240 ft. Conemaugh Sandstones and shales with coal and fireclay; 600-700 ft. Allegheny Sandy and carbonaceous shales and sandstones with coal seams; 260-350 ft. Pottsville Massive conglomerates and sandstones with fireclay and coal; 330-380 ft.	
Mississippian	Mauch Chunk Red shales and sandy shales and thin sandstones; 650 ft. Greenbrier Gray and brown siliceous limestones; 400 ft. Pocono Massive gray coarse sandstone; 250 ft.	
Devonian. Upper Devonian ...	Catskill (Hampshire). Alternating red shales and sandstones; 1900-2000 ft. Jennings (Genesee-Portage-Chemung) Vari-colored shales and sandstone; 3800-4000 ft.	

Middle Devonian ..Romney
(Onondaga-Marcellus-Hamilton.)
Dark gray shales and sandstones; 1600 ft.

Lower Devonian ..Oriskany
Cherty calcareous sandstones; 325-350 ft.

Helderberg
(Keyser-Coeymans-New Scotland-Becraft.)
Dark blue and gray limestones; 350 ft.

Silurian .....Tonoloway
Argillaceous limestone with some interbedded calcareous shale. The limestone weathers into hard platy fragments which ultimately form a red soil; 600 ft.

Wills Creek
Calcareous shale with some interbedded argillaceous limestone, weathering into soil containing few rock fragments. Four cement beds are present. The Round Top member at the base of this formation consists of red shale and sandstone. Several beds of sandstone also occur in the upper part of the formation; 550 ft.

McKenzie
Drab shale alternating with thin beds of limestone; 275 ft.

Clinton
Vari-colored shales and sandstones with iron ore-bands; 550-600 ft.

Tuscarora
Massive white quartzitic sandstone; 250-300 ft.

Juniata
Alternating thin-bedded red shales and sandstones; 650 ft. exposed.

		Peachbottom slate High grade blue-black roofing slate.
		Cardiff quartzite Finely conglomeritic quartzite.
Ordovician	Martinsburg Dark slaty shales; 700-1000 ft.	Wissahickon phyllite and schist Sericite and chlorite schists with numerous quartz eyes. Mica schists and gneiss usually much crinkled and carrying garnets, cyanite and staurolite.
	Chambersburg Thin-bedded, dark, fossiliferous limestone with irregular clayey partings; 100-750 ft.	
	Stones River Thin-bedded, pure, even-grained limestone with thin chert stratum near the middle; 675-1050 ft.	
	Beekmantown Thick-bedded limestone with interbedded magnesian beds and layers of oolite, conglomerate, and cherts at several horizons; 2785 ft.	
Cambrian	Conococheague Thin-bedded, blue, banded limestone with siliceous laminae, conglomeratic at base; 1635 ft.	Cockeysville marble Fine and coarse-bedded crystalline marble frequently dolomitic.
	Elbrook Gray to pale-blue shaly limestone and calcareous shales with thick-bedded, siliceous limestone in the lower and middle part; 3000 ft.	
	Waynesboro Gray calcareous sandstones and purple shales; 1000 ft.	
	Tomstown Massive and thin-bedded limestone, in part cherty and magnesian, with shale and white clay at the base; 1000 ft.	

	Antietam Dull brown sandstones grading into shales; 500-800 ft.	
	Harpers Gray, sandy shales with sandstone layers; 2750 ft.	Setters quartzite and mica-schist
	Weverton White sandstone quartzite and conglomerate; 1250 ft.	Micaceous quartz schist or vitreous quartzite usually carrying black tourmalines.
	Loudon Dark slate with limestones, shales; sandstones and conglomerates; 100-500 ft.	
ARCHEAN. Algonkian	Acid and Basic Volcanics Fine grained compact rocks usually much altered by development of sericite and epidote.	Baltimore gneiss, etc. Highly crystalline gneiss of alternating hornblendic, micaceous and quartzose types, often intruded with pegmatites, granites, gabbros and serpentines.

LIST OF OPERATORS.

COAL.

ALLEGANY COUNTY.

OPERATOR.	OFFICE.	MINE.
Consolidation Coal Co.	Baltimore	Consolidation Nos. 1 to 11.
Union Mining Co.	"	Union.
New York Mining Co.	Mt. Savage	Union Nos. 1 and 2.
Barton and Georges Creek Valley Coal Co.	Baltimore	Carlos.
Potomac Coal Co.	"	Potomac.
Georges Creek Coal Co., Inc.	"	Nos. 1, 12, 13, 14, 16, 17.
American Coal Co.	Lonaconing	Caledonia and Jackson.
Maryland Coal Co.	New York	Appleton, Kingsland, New Detmold and Patton.
New Central Coal Co.	"	Koontz & Big Vein.
Piedmont and Georges Creek Coal Co.	Frostburg	Washington Nos. 1 to 5.
Piedmont Mining Co.	Baltimore	Pekin.
Midland Mining Co.	Cumberland	New Enterprise and Trimble.
Bowery Coal Co.	Frostburg	Bowery.
H. & W. A. Hitchens Coal Co.	"	Borden.
Phoenix and Georges Creek Mining Co.	Phila., Pa.	Phoenix and Elkhart.
Brailer Mining Co.	Mt. Savage	Bald Knob.
Moscow-Georges Creek Mining Co.	Cumberland	Moscow Nos. 1 and 2.
Frostburg Fuel Co.	Frostburg	Tyson No. 2.
Chapman Coal Mining Co.	Baltimore	Swanton.
Cumberland-Georges Creek Coal Co.	Phila., Pa.	Penn.
Frostburg Coal Mining Co.	"	Morrison.
Maryland Coal & Iron Co.	Frostburg	Trotters Run.
Davis Coal & Coke Co.	Baltimore	Buxton.
Wachovia Coal Co.	Cumberland	Waco.
Cumberland Basin Coal Co.	Phila., Pa.	Parker, Bond and Cook.
Rawlings & McCulloch.	Frostburg	Bloen Avon.
Chabot Coal Co.	Eckhart Mines	Chabot.
Michael Barnard	"	Parkersburg.
The Franklin Coal Co.	Westernport	Franklin No. 1.

GARRETT COUNTY

George C. Pattison.	Bloomington	Pattison.
Bloomington Coal Co.	"	Bloomington.
Monroe Coal Mining Co.	Bethlehem, Pa.	Elk Run Nos. 1 and 2.

Three Forks Coal Mining Co.	Blaine, W. Va.	Jasper.
Hamill Coal & Coke Co.	"	Hamill No. 1.
Potomac Valley Coal Co.	"	Dante.
Blaine Mining Co.	New York	Blaine.
Garrett County Coal & Mining Co.	Bethlehem, Pa.	Dodson Nos. 1, 2, and 4.
Upper Potomac Coal Co.	Phila., Pa.	Upper Potomac.
Brainard Coal Co.	"	Nos. 1, 2 and 3.
Glade Run Coal Co.	"	Beechwood.
Cutchell and Gates.	Bayard, W. Va.	Bayard.
Western Maryland Coal & Coke Co.	Friendsville	Nos. 1, 2, and 3.

LIME AND CEMENT.

OPERATOR.	OFFICE.	QUARRY.
Wm. H. Everhart	Westminster	Bachmans Mills.
O. J. Keller Lime Co.	Buckeystown	Buckeystown.
Geo. M. Bushey & Son	Cavetown	Cavetown.
A. M. Isanogle	Thurmont	Catoctin.
James F. McKee	Clear Springs	Clear Springs.
Miss M. Bissell Price	Cockeysville	Cockeysville.
Denton S. Warehime	Westminster	Cranberry.
Henry J. Kneriem	"	Cresaptown.
* Cumberland and Potomac Cement Co.	Cumberland	Pinto.
* Cumberland Hydraulic Cement & Mfg. Co.	"	Cumberland.
Joseph Dressman	Long	"
C. A. L. Miller	Cumberland	"
John D. Crum	Walkersville	Daysville.
T. Turnbaugh	Boring	Dover.
George W. Hose	Clear Spring	Dry Run.
J. J. Brown	Smithsburg	Edgemont.
Fountain Rock Lime Co. (J. W. Stimmel)	Woodsboro	Walkersville.
M. J. Grove Lime Co.	Limekiln	Frederick and Limekiln.
R. Rush Lewis	Frederick	Frederick.
Tabler Lime & Stone Co.	"	"
Gilmer Schley	"	"
D. C. Kemp Lime Co.	"	"
Charles A. Councilman	Glyndon	Glyndon.
Edward A. Cockey & Son	Owings Mills	Gwynnbrook.
* Security Cement & Lime Co.	Hagerstown	Security.
W. M. Widmyer	Hancock	Hancock.
Daniel Sunday	Hansonville	Hansonville.
George W. Yost	Clear Spring	Clear Spring.
T. Guy Nichols	Brookville	Highland.
LeGore Lime Co.	LeGore	LeGore.
M. Frank McAleer	Walkersville	McAleers.
G. T. Baker	Marriottsville	Marriottsville.
Daniel F. Roddy	Mt. St. Mary's	Motters.
George H. Strine & Son	Mt. Pleasant	Mt. Pleasant.
D. K. Cramer	"	"
Mordecai C. Jones	"	New London.
Louis C. Zile	New Windsor	New Windsor.
Henry Mosser	Oakland	Oakland.
J. L. Federline	Olney	Olney.

Potomac Valley Stone & Lime Co.	Hagerstown	Pinesburg.
D. D. Keedy	Keedysville	Rohrersville.
J. Hubert Wade	Boonsboro	Sharpsburg.
John T. Dutterer	Silver Run	Silver Run.
Wm. A. Leppo	"	"
Rohrer Bros.	Smithsburg	Smithsburg.
Wm. C. Dittman	Texas	Texas.
Wm. P. Lindsay	"	"
Effie D. & J. H. Creeger, Admin.	Thurmont	Thurmont.
Joseph F. Moser	"	"
F. A. Roddy	"	"
David G. Zentz	"	"
* Tidewater Portland Cement Co.	Union Bridge	Union Bridge.
Wm. H. Hyde	"	"
David Cramer	Walkersville	Walkersville.
David A. Devilbiss	"	"
Fountain Rock Lime Co	Woodsboro	"
Goodwin Lime Co	Westminster	Westminster.
Wm. R. Yingling	"	"
David Robertson	"	"
B. F. Shriver & Co	"	"
Wm. A. Roop	"	"
Mrs. Catherine Wagner	"	"
Wakefield Mill & Lime Co	"	"
Milton M. Morelock	"	"
Wm. B. Thomas & Son	"	"
Charles F. Trescher	Cumberland	Winchester Bridge.
S. W. Barrick & Son	Woodsboro	Woodsboro.
Jacob Eichelberger	"	"

* Cement Operators.

CLAY AND CLAY PRODUCTS.

BRICK AND TILE.

OPERATOR.	OFFICE.	WORKS.
Baltimore Brick Co	Baltimore	Baltimore City and County.
Baltimore Retort & Fire Brick Co.	"	Baltimore.
Westport Paving Brick Co	"	Westport.
Columbia Stove Brick Works	"	Baltimore.
Baltimore Terra Cotta Works	"	"
Berlin Brick Co	Berlin	Berlin.
C. T. Neepier	Catonsville	Catonsville.
South Baltimore Harbor and Improvement Company	Baltimore	Brooklyn.
C. F. Thomas & Son Brick Co.	Buckeystown	Buckeystown.
Cambridge Brick Co	Cambridge	Cambridge.
Barnett & Robinson	"	"
H. S. & V. M. Barnett	Chestertown	Chestertown.
George M. Collins	Crisfield	Crisfield.
Queen City Brick & Tile Co	Cumberland	Cumberland.
Cumberland Granite Brick Co.	"	"
Burns & Russell Co	Baltimore	Dundalk.
The Maryland Terra Cotta Co	"	"
The Easton Brick & Tile Mfg. Co.	Easton	Easton.
John Gilpin Brick Co.	Elkton	Elkton.
Frederick Brick Works	Frederick	Frederick.
Maryland Brick & Supply Co	"	"

Savage Mountain Fire Brick Co.	Frostburg	Frostburg.
Big Savage Fire Brick Co.	"	"
Bilbrough & Bros.	Greensboro	Greensboro.
Henson Brick & Supply Co.	Hagerstown	Hagerstown.
James E. S. Pryor	"	"
L. H. Wiebel	"	"
Excelsior Brick & Pottery Co. of Baltimore	Halethorpe	Halethorpe.
Hancock Shale Brick Co.	Hancock	Hancock.
F. F. Greenwell	Leonardtown	Hanover Mills.
Ferdinand Cook	Federalsburg	Hynson.
Elias W. Oursler	Westminster	Westminster.
H. K. Oursler	"	"
Andrew Ramsay	Mt. Savage	Mt. Savage.
Union Mining Co. of Allegany Co.	"	"
Big Savage Fire Brick Co.	Frostburg	Allegany.
Mayer Bros.	"	Frostburg.
Muirkirk Brick Co.	Washington, D. C.	Muirkirk.
Green Hill Fire Brick Co.	North East	North East.
North East Fire Brick Co.	"	"
United Fire Brick Co.	"	"
Columbia Brick and Plaster Co.	"	"
Independent Brick Co.	Orangeville	Orangeville.
Hugh McMichael	Pocomoke City	Pocomoke City.
Princess Anne Brick Co.	Princess Anne	Princess Anne.
Somerset Tile Co.	"	"
David S. Strayer & Sons	Ridgley	Ridgley.
Champion Brick Co.	Baltimore	Rosedale.
Hans Kudritzky	St. Michaels	St. Michaels.
Peninsula Brick Co.	Salisbury	Salisbury.
Salisbury Brick Co.	"	"
W. L. Purnell	Snow Hill	Snow Hill.
W. S. Lewis & Son	"	"
D. W. Zentz	Thurmont	Thurmont.
V. Bonomo	Westover	Westover.
Wicomico Brick Co.	Salisbury	White Haven.
Conococheague Brick & Earthernware Co	Williamsport	Williamsport.
Laurel Brick Works	Laurel	Laurel.

POTTERY.

OPERATOR.	OFFICE.	WORKS.
Edwin Bennett Pottery Co.	Baltimore	Baltimore.
Chesapeake Pottery	"	"
Columbia Stove Brick Works	"	"
M. Perine & Sons	"	"
Balto. Clay Tobacco Pipe Works	"	"
George S. Kalb & Sons	Catonsville	Catonsville.
J. J. Nottnagel & Son	Frederick	Frederick.
Excelsior Brick & Pottery Co.	Halethorpe	Halethorpe.

RAW CLAY.

OPERATOR.	OFFICE.	WORKS.
Big Savage Fire Brick Co.	Frostburg	Allegany.
Savage Mt. Fire Brick Company	"	Frostburg.
S. C. Chew	Mantua, N. J.	Bacon Hill.

Ernest Hartung	Baltimore	Baltimore.
J. C. Weaver's Sons	"	"
A. Hopkins	Dorsey	Dorsey.
Chas. W. Simpers	North East	Eder and Leslie.
W. R. Grosh, Estate of	Elkton	Elkton.
Josephus Smith	Hanover	Hanover.
Union Mining Co. of Allegany Co.	Mt. Savage	Mt. Savage.
American Clay Co.	Philadelphia, Pa.	North East.
Hanna Mining Co.	North East	"
North East Fire Brick Co.	"	"
Owens & Stadelman	"	"
E. Vernon Zimmerman	Woodlawn	Catonsville.
Maryland Terra Cotta Works	Halethorpe	Halethorpe.
Frederick Link	"	Washington Road.
J. Frank Kalb	Woodlawn	Woodlawn.

GRANITE.

OPERATOR.	OFFICE.	QUARRY.
J. H. Atkinson	Baltimore	Baltimore.
Harry C. Campbell	Windsor Hills	Windsor Hills.
Wm. M. Longley Quarry Co.	Baltimore	Franklin Road.
Daniel A. Leonard	"	Baltimore.
The I. H. Peddicord & Sons Quarry and Transfer Co.	"	Gwynns Falls.
The Schwind Quarry Co.	"	Baltimore.
The Hook & Ford Contracting Co.	"	Woodberty and Dickeyville.
Standard Lime & Stone Company	"	Boonsboro and Dickerson.
Werner Bros.	Ellicott City	Ellicott City.
Lukens & Yerkes	Philadelphia	Frenchtown.
Chas. E. Ehmann	Baltimore	Govanstown.
Feaney & Atherton	Granite	Granite.
Guilford & Waltersville Granite Co.	Baltimore	"
Miller & Kirkpatrick	Guilford	Guilford.
The Perryville Granite Co.	Easton, Pa.	Perryville.
McClenahan Granite Co.	Port Deposit	Port Deposit.
J. E. Baker	York, Pa.	Phœnix.
Thos. B. Gatch & Sons	Raspburg	Raspburg.
Frank H. Zouck	Reisterstown	Reisterstown.
John F. Parks	Timonium	Ruxton.
Thos. S. Gerry	Rowlandsville	Rowlandsville.
Armstrong & McDowell	Port Deposit	"
B. F. Pope Stone Company	Baltimore	Savage.
Frank Peach & Co.	Woodstock	Woodstock.
Potomac Granite Co.	Washington, D. C.	Montgomery Co.
W. T. Manning	Baltimore	near Savage.
Conway Quarry Company	"	Lochraven.
Thomas R. Martin & Sons	Woodlawn	Franklintown.
McMahon Bros.	Mt. Washington	Mt. Washington.
John Walters	Baltimore	Pikesville.
McGuire & Shea	Ruxton	Ruxton.
Blue Mount Stone Co.	Whitehall	Whitehall.
The Casparis Stone Co.	Columbus, Ohio	Havre de Grace.

LIMESTONE.

OPERATOR.	OFFICE.	QUARRY.
Fisher & Carozza	Baltimore	Green Sprg. Valley.
Geo. M. Bushey & Son	Cavetown	Cavetown.
George Downin	Hagerstown	Cearfoss.
Cumberland Hydraulic Cement & Mfg. Company	Cumberland	Cumberland.
John D. Crum	Walkersville	Daysville.
Wm. F. Myers	Boring	Dover.
Peter Brookey	Frederick	Frederick.
Ezra Houck, Jr.	"	"
M. J. Grove Lime Co.	Limekiln	Frederick and Limekiln.
R. Rush Lewis	Frederick	Frederick.
Charles A. Councilman	Glyndon	Glyndon.
Edward A. Cockey & Son	Owings Mills	Gwynnbrook.
S. P. Angle	Hagerstown	Hagerstown.
Clarkson Brothers	"	"
Hagerstown City Quarry	"	"
Union Stone Co.	York, Pa.	Halfway.
Frank P. Little	Hancock	Hancock.
LeGore Lime Co.	LeGore	LeGore.
P. P. Zepp	Marriottsville	Marriottsville.
Daniel R. Miller	Maugansville	Maugansville.
Wm. Carbaugh	New Windsor	New Windsor.
Potomac Valley Stone Co.	Hagerstown	Pinesburg.
D. D. Keedy	Keedysville	Rohrersville.
A. M. Isanogle	Catoctin	Thurmont.
David Cramer	Walkersville	Walkersville.
D. A. Devilbiss	"	"
Goodwin Lime Co.	Westminster	Westminster.
Wm. R. Yingling	"	"
B. F. Shriver & Co.	"	"
E. C. Brown	"	"
Myers-Crump Stone Co.	Corrigansville	Corrigansville.
Allegany County Road Directors	Cumberland	Mt. Savage.
W. C. Ditman	Texas	Texas.
Miss M. Bissell Price	Cockeysville	Cockeysville.
Baltimore Marble & Trading Co.	Baltimore	Lochraven.
Tabler Lime & Stone Co.	Frederick	Frederick.
C. F. Hammond	Oakland	Oakland.

MARBLE.

OPERATOR.	OFFICE.	QUARRY.
Beaver Dam Marble Co.	Baltimore	Cockeysville.
Washington Marble Co.	New York	Eakles Mills.
The Eastman Stone Co.	Baltimore	Whitehall.
Baltimore County Marble & Trading Co.	"	Baltimore.
Maryland-Alabama Marble Co.	New York	Benevola.
L. C. Rines	Eakles Mills	Boonsboro.
Whiteford Green Marble Co.	Whiteford	Cambria.
Cardiff-Cambria Marble Co.	New York	Cardiff.

SANDSTONE.

OPERATOR.	OFFICE.	QUARRY.
E. C. Schaidt	Cumberland	Cumberland.
J. C. Brydon Bros. Co.	Grafton, W. Va.	Bloomington.
J. T. Bridges & Co.	Hancock	Hancock.
B. S. Randolph	Berkeley Spgs., W. Va.	Dam No. 6.
Samuel Spangler	Taneytown	Kump.
William Clutz	"	Taneytown.
T. H. Eckenrode	"	"
James D. Haines	"	"
James B. Reaver	"	"
O. T. Shoemaker	"	"

SLATE.

OPERATOR.	OFFICE.	QUARRY.
Baltimore Peach Bottom Slate Co.	Baltimore	Cardiff.
Cardiff Peach Bottom Slate Mfg. Co.	Delta, Pa.	"
Peach Bottom Slate Co. of Harford County	"	"
Peerless Slate Co.	"	"
The Proctor Slate Co.	"	"
South Delta Peach Bottom Slate Co.	"	"
Bennett Creek Slate Co.	Washington, D. C.	Thurston.

FLINT AND FELDSPAR.

OPERATOR.	OFFICE.	QUARRY.
A. M. Benzinger	Woodstock	Woodstock.
J. T. Cavey	"	"
Deland Mining & Milling Company.	Havre de Grace	Baldfriar.
Harry Fairbank	Woodstock	Woodstock.
Parlett & Cavey	"	"
E. E. Fagan	Gwynn Oak, Baltimore.	Hollofields.
Golding Sons Co.	Trenton, N. J.	Rock Springs and Davis Station.
Guilford & Waltersville Granite Co.	Baltimore	Woodstock.
Thomas & Son	Westminster	Westminster.
Eureka Mining & Operating Co.	Trenton, N. J.	Granite.
H. Clay Whiteford & Co.	Flintville	Flintville.
Glen Morris Supply Co.	Glen Morris	Glen Morris.
Harford County Flint Co.	Conowingo	Conowingo.
Geo. W. Cavey	Woodstock	Woodstock.
Peach & Whelan	Glenarm	Notchcliff and Glenarm.
The Husband Flint Co.	Baltimore	Deer Creek.

SAND AND GRAVEL.

OPERATOR.	OFFICE.	PITS.
Arundel Sand & Gravel Co.	Baltimore	Spring Gardens, Magothy River, and Curtis Creek (dredging).

Columbia Granite & Dredging Co.	Washington, D. C.	Marshall Hall.
Potomac Granite Co.	"	on Canal near Washington.
Potomac Dredging Co.	"	near Washington.
Excelsior Brick & Pottery Co.	Halethorpe	Arbutus.
Adam John & Bro.	"	Benson Ave.
John C. Leonard	Baltimore	Baltimore.
J. T. Bridges & Co.	Hancock	Hancock.
P. L. Hopper	Havre de Grace	Conowingo.
B. S. Randolph	Berkeley Spgs., W. Va.	Dam No. 6.
The Cumberland Granite Brick Co.	Cumberland	Cumberland.
Cumberland Sand Co.	Pittsburg	"
Contee Sand & Gravel Co.	Laurel	Laurel.
Brennan Sand Co.	Philadelphia, Pa.	Robinson.
Foltz Bros.	Waynesboro, Pa.	Rock Forge.
James D. Haines	Taneytown	Taneytown.
Fred. Link	Halethorpe	Halethorpe.
H. L. Thomas	Norfolk, Va.	Gibson Island.
W. T. Manning	"	near Laurel.
Clark Bros.	Severn	Severn.
Roland Park Company	Roland Park	Roland Park.
Wm. R. Della	Baltimore	Curtis Creek.
Miss M. Bissell Price	Cockeysville	Cockeysville.
DeBoy Sandman Co.	Halethorpe	Halethorpe.
Joseph E. Smith	Westport	Westport.
Deland Mining & Milling Co.	Havre de Grace	Havre de Grace.
A. V. Hoffman	Smithsburg	Leitersburg.
Andrew Miller	"	"
Ernest Lecrone	"	Rock Forge.

GOLD.

OPERATOR.	OFFICE.	MINE.
Capital Gold Mining & Development Co.	Cropley	Cropley.
R. Scott Allen	"	"
Maryland Gold Mining Co.	"	"
Great Falls Gold Mining Co.	Washington, D. C.	Great Falls.

COPPER.

OPERATOR.	OFFICE.	MINE.
Virginia Consolidated Copper Co.	Union Bridge	Liberty.

IRON ORE.

OPERATOR.	OFFICE.	MINE.
Mason & Dixon Mining Co.	Shrewsbury, Pa.	Bachmans Mills
Ebbvale Mining Co.	Hanover, Pa.	Ebbvale.
Ellery F. Coffin	Muirkirk	Muirkirk.
Jos. E. Thropp	Everett, Pa.	Thurmont.

MINERAL PAINT.

OPERATOR.	OFFICE.	PIT.
Jas. B. Macneal & Co.	Baltimore	Baltimore and vicinity.
Wm. Dagler	Hanover	Hanover.
Hanna & Andrus	Chicago, Ill.	"

SPRINGS.

OPERATOR.	OFFICE.	SPRING.
Altamont Spring Water Co	Washington, D. C	near Deer Park.
Carroll Springs	Forest Glen	Forest Glen.
Chattolanee Spring Water Co	Baltimore	Chattolanee.
Mardela Mineral Spring Water Co	Mardela	Mardela.
Rockhill Indian Spring	Rockville	Rockville.
Buena Vista Spring Water Co	Baltimore	Edgemont.
Castalia Spring Water Co	Washington, D. C	Branchville.
Spaws Spring Water Co	Easton	Easton.
Ruxton Heights Water Co	Baltimore	Ruxton Heights.
Sylvan Dell Water Co	"	Rognel Heights.
Hillsdale Water Co	"	Hillsdale.
Caton Spring Water Co	"	Catonsville.
Hancock Sulphur Springs	Hancock	Hancock.

SILICA.

OPERATOR.	OFFICE.	PIT.
Maryland Silicate Co	New York	Lyons Creek.

TALC AND SOAPSTONE.

OPERATOR.	OFFICE.	QUARRY.
Deland Mining & Milling Co	Havre de Grace	Bald Friar.
Thomas & Son	Westminster	Westminster.
Maryland Soapstone Co	Baltimore	Marriottsville.