The Geological Survey is making a geographic map of the United States, which necessitates the preparation of a topographic base map. This map will be used as the basis for all other surveys. The survey will extend to the limits of the continental United States, and will include all of the states and territories. The map will be at a scale of 1:62,500, and will be printed in black and white.

3. Contours define the forms of slopes. Since contours are contoured lines of equal elevation, they indicate the relative heights and depths of the various parts of the land. The lines are drawn on the map at intervals of 20 feet, and are numbered from 1 to 100, inclusive. Each contour represents an elevation of 20 feet above the previous contour.

Uses of the topographic sheet. - Within the limits of the scale the topographic sheet is an accurate representation of the surface of the earth, and is useful for various purposes, such as: for the location of minerals; for the location of water resources; for the location of natural resources; and for the location of cultural resources.

The Geologic map represents by colors and conventions, on the topographic base map, the distribution of rock formations on the surface of the earth, and the structures and maps show their underground relations, as far as known, and in such detail as the scale permits.

Kinds of Rocks.

Rocks are divided into three main classes: igneous, sedimentary, and metamorphic. Each of these classes is further subdivided into several types.

1. A contour indicates approximately a certain height above sea-level. In this illustration the height at which a contour occurs is given as 100 feet, and the intervals between contours are 20 feet.

2. A contour is a line on a topographic base map which represents a given elevation above sea-level. The contour lines are drawn at intervals of 10 feet, and are numbered from 1 to 100, inclusive. Each contour represents an elevation of 10 feet above the previous contour.

The sketch represents a valley running between two hills. In this illustration the contours are shown at 100 feet above sea-level, and the intervals between contours are 10 feet. The height of each contour is indicated by the number of the contour line.

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DESCRIPTION OF THE NOMINI SHEET.

GEOGRAPHY.

The province. - The area lying between the Atlantic Ocean and the Blue Ridge and stretching from the Hudson to Roanoke River is made up of two distinct geologic provinces. The first of these borders the ocean and is trimmed by tidal estuaries; it is known as the Coastal Plain. The second province lies between the fall-line and the south shore of the Appalachian Mountain chain (the Blue Ridge in Virginia), and is known as the Piedmont Plateau. The area of the Nominii sheet lies entirely within the Coastal Plain province.

While it is convenient to fix the eastern boundary of the Coastal Plain at the Atlantic shore-line, it may be more judicious drawn 100 miles off shore, at the edge of the continental plateau, where the great expanse, 3,000 to 10,000 feet high, is swept by the Gulf Stream. From the fall-line to the verge of this escarpment stretches a wonderfully smooth and even plain, including gently southwestwardly, broken only by the shallow and broad valleys of the rivers and estuaries and by the present sheets, with their wave-buried rocks and sand cliffs. The highest point of the province rises 300 feet above tide; its submarine margin is about 300 feet below tide. So gently is the fall-line and so perfectly uniformity of the plain that if the land were elevated or depressed 100 or 200 feet the shore-line would simply be shifted about as many miles. Thus the position of the coast may be considered an accident of the present slope and altitude of the land.—The mouth of the Hudson and Chesapeake Bay the present coast does not coincide with the trend of the province, but cuts obliquely across half its width, so that while only about half the province is submerged in the latitude of Richmond, it is nearly all beneath the plateau of the New York.

Below tidewater the province is an even and nearly level seabed; above tidewater it is a broadland of flat, flat fields, which skirt the coast and the estuaries. The elevated plains toward the low divides. The principal waterways are broad yet shallow estuaries, fringed sometimes by tidal marshes, sometimes by low sea-cliffs; the lesser waterways are common estuaries in their lower reaches, but narrow and steep-bluffed in the upper reaches, frequently heading in narrow ravines cut sharply in the extensive plains of the divides.

TOPOGRAPHY.

The Nominii area. — The area included in the Nominii sheet is one-quarter of a square degree, and is bounded by the parallels 38° and 40° and the meridians 76°, 77° and 78°. It measures approximately 345 miles from north to south and 375 miles from east to west, and embraces 928 square miles. The area lies partly in Virginia and partly in Maryland. In Virginia it comprises nearly all of Northwestern county, with parts of Essex, Northernland, and Richmond, and in Maryland it includes portions of St. Mary, Charles, and Calvert counties.

Topographic types. — In addition to the water area (chiefly the Piedmont estuary) the province is characterized by two distinct types of topography: (1) the more elevated, or upland, portions of the Coastal Plain, and (2) the lowlands flanking the waterways.

GENERAL SECTION THROUGH THE NOMINII TRACT.

Geologic formations of the Nominii area comprise clays, sands, loams, marls, diatomaceous earths, and marly accumulations. They belong to three extensive formations lying one over another and dipping gently outward, partly overlain by a fourth deposit which is thinly spread over the lower areas along the rivers and estuaries, generally in the form of terraces. These formations overlap one or two other similar formations which rest on the irregular surface of the crystal line rocks of the Piedmont region.

Classified by origin, the geologic deposits of the Coastal Plain consist of littoral-sand sediments which are somewhat arbitrarily subdivided into two categories: the first consisting more or less closely to those now in process of deposition in the estuaries and along the shores in the immediate vicinity, the second consisting closely to offshore sediments known from the processes of deposition in the distant past. The deposits consist of marine fossils, with and without plant remains. The younger formations record certain modifications of the coastal land and, moreover, display certain distinctive characteristics indicating the climate of the periods during which they were laid down.

It may be noted that while the marsh lands are subject to much less artificial control, the area in which they occur is affected by the slow submergence of the Coastal Plain, so that the local tendency is toward shallowening of the estuaries and thus toward increase of the marsh area.

The Columbia formation. — One of the more extensive geologic formations of the Nominii tract is a deposit of loams and gravel or boulders along the waterways and extending for some distance up the tributary valleys toward the lower divides. Along the rivers the deposit is fairly uniform, consisting of a bed of loam (i.e., sand and clay mixed in various proportions) 5 to 20 feet thick, grading downward into a bed of boulders, gravel, or sand, all combined, to 5 to 10 feet thick, the lower layers being commonly unstratified, and the upper layers stratified and cross-bedded. This is the final phase of the formation. Toward the lower divides the deposit is reduced to an irregular bed of water-washed and reworked materials, composed in part of debris derived from the underlying formations in the immediate vicinity, in part of debris transported from greater distances by streams or currents; this being the interfluvial phase of the formation which is not well developed in the Nominii tract. The two phases are formed under the name Columbia formation, in which the two deposits are typically expected.

Within the Nominii tract the materials of the Columbia formation are also quite variable. On the terraces adjoining the larger rivers the upper portion consists of a fairly homogenous bed of loam, while the lower portion is stratified and
contains coarser materials—mainly quartz and quartize gravel and boulders, and coarse sand, together with layers of fine sandstone. The sands are usually large and contain layers of the lower member is coarse, frequently containing pebbles, and even boulders, from the later deposits. The gravel of the northwestern part of the area is light yellow or brown, and is determined by the presence of ferric oxide. There are places where the color is variously light brown or yellow, and the ferric oxide in the rock is absorbed, giving it a yellowish color. The ferric oxide is usually absorbed by the rock, and the rock is usually light yellow or brown, and is determined by the presence of ferric oxide. There is a large amount of ferric oxide in the rock, which is usually absorbed by the rock, and the rock is usually light yellow or brown, and is determined by the presence of ferric oxide. The ferric oxide in the rock is absorbed, giving it a yellowish color.

On the whole, the materials of the Columbia deposits resemble in considerable measure those transported today by the Columbia River, and the materials of the Columbia deposits are similar in appearance to that of the Columbia River. The materials differ from those laid down during ordinary floods, and the materials of the Columbia deposits are not the same as those deposited by the Columbia River. The materials of the Columbia deposits are not the same as those deposited by the Columbia River.

The Columbia formation occurs chiefly in broad terraces that grade into the main waterway and reach altitudes ranging from 30 to 60 feet above the river. The higher altitudes are attained mainly in the valleys of the smaller streams, and at a considerable distance back from the river. In the broad terraces the altitude is determined by gentle slope and low terraces. Originally the deposits of the Columbia River, as well as the deposits of the Columbia River, were lower than the deposits of the Columbia River. Along the river the formation usually rises in low cliffs, which are kept steep by waves and tidewater. The river may be thought of as a large river, but the river may be thought of as a large river, and the river is considered as a large river. The surface of the river is determined by the presence of the river, and the surface of the river is determined by the presence of the river. The surface of the river is determined by the presence of the river. The surface of the river is determined by the presence of the river. The surface of the river is determined by the presence of the river.

The Columbia formation is of considerable interest as showing the extent to which the Columbia River has been eroded. The surface of the river is determined by the presence of the river. The surface of the river is determined by the presence of the river.
moderate declivity, though asorted and deposited as by waves and littoral currents; the distrees are such as lave in a craft with which waters in temperate and subtropical zones; the glauconite deposits are such as are produced by the action of certain mineral organisms in sea water on feldspar and other constituents of crystalline rocks. Thus the deposit is a record of the geographic and climatic conditions existing at the time of deposition; while the slightly discolored unconsolod conditions by which it is bound indicated that the general lower beds of sand are coarse, angular or subangular grains of quartz, and frequently, not usually, these are associated with the more variable materials of the white clay. The clays are red, gray, or buff in greater part, and alternate with sands. The formation is characterized by the presence of calcareous rock fragments, including lines—granules, gneiss, etc., and has a thickness of about 350 feet, or possibly somewhat less.

GEOLOGIC HISTORY OF THE COASTAL PLAIN.

The history of the Nomini tracts is intimately connected with that of contiguously areas, and in part is interpreted thereby. The history includes the era and episodes in the building of the Coastal Plain out of materials gathered largely from the Piedmont province. The record is clear, alluvial and coastal plains, with the principal events have been interpreted. The principal movements are summarized in the following table:

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea-level fall</td>
<td>Sea-level fall caused by a glacial event, resulting in a drop of several feet.</td>
</tr>
<tr>
<td>Sea-level rise</td>
<td>Sea-level rise due to melting of glaciers, leading to a rise of several feet.</td>
</tr>
<tr>
<td>Tectonic uplift</td>
<td>Tectonic uplift due to板块构造 activity, causing a rise of several feet.</td>
</tr>
</tbody>
</table>

From the Potomac to the period of the Chesapeake, the Nomini hill tracts as elsewhere in the Coastal Plain, the first event in the history was one of submersion of the land, in which every downward movement was accompanied by slight seaward tilting; and the cycle of events to the present time is a gradual diminution of the amplitudes of the oscillations progressively diminished.

With the diminution in movement of the earth-crest from era to era, the rivers and rivers and waves advanced progressively, and the chemical agencies of decomposition and vital reconstruction increased relative in the earth-crest. This series of diminishing mechanical and increasing chemical activity continued after the deposition of the Chesapeake sands, and the land again lifted until the ocean retreated well beyond the brink of the Coastal Plain, the lifting being accompanied by a slight seaward tilting.

Thus, while the era was one of degradation, the stream work was feeble, and the depositions of the tidal basins which later extended along the shore were free from the eastward movement of the tides which the Recent formations are generally regarded as having been caused by the operation of the forces of subaerial erosion.

At the end of this era of stable land and preponderant chemical action, the diminishing series of river and tidal depositions came to an end and a new series of earth-crest movements began.

The next episode was introduced by a strong waning of the earth-crest, whereby the intertidal area was flooded and the shoreward depression increased. The hills were so pronounced that the ocean encroached on the erstwhile land, and the newer land was formed.

The first writer in the history thus followed was one of degradation, represented by the erosion of the Nomini hill tracts, and continued until the period of this era. During this period the land stood so high that the sea, which reached the high points of the Nomini tracts, was never sufficiently deep to deepen its channels. It was a period of base-level planation of sluggish degradation by the little streamlets toward the divide as well as by the great rivers in the valleys; and there were minor oscillations of such extent that in adjacent regions other deposits (notably the Sevier formation of northern Maryland) were laid down. How far westward the Potomac sediments originally extended, and how great a volume of material was degraded during this epoch, are not known; but the configuration of the unconformity between the Potomac formation and the marine deposits of the Piedmont and Coastal zones were placed to a fairly uniform surface, with few deep valleys and ridges, and that the piedmont Potomac waterways extended their courses over the naseous Coastal Plain to reach the ocean.

The next event was a subsidence of the land and adjacent sea-bottom, more uniform than the last, of such extent that the ocean again advanced, and in the same manner as before the Potomack waters charged with the friable residuary clays and loams. In this way the waves were fed by the same material to which the coastal Plain was formed, and the fine were intermingled in unusual fashion. Through this combination of causes and agents, the eroded material was again deposited in a relatively uniform coastal Plain formation was built.

The next record is one of degradation; and the continued movement initiating East Tidal Basin deposition was more energetic than for ages, so is about the same ratio as the next Potomac uplift.

The hill was so high that the ocean retreated to or beyond the brink of the Coastal Plain, and the rivers eroded and carved the steep-sided Piedmont and Appalachian gorges. This attitude of the land persisted not until the Coastal Plain waterways cut through the Lafayette formation, but until many of them vanished under the underlying formations, and until all but a large aggregate volume of the Lafayette deposits was carved away, and charged with organization as a series of remnants.

Then came another epoch of degradation, during which the Potomack-Potomac surface was continued, and the ocean watered more level even than that of the Potomac. Minor oscillations during this period, in the form of minor ridges and valleys, were probably the snow fall deep, and during the freshet snows formed by exceptional size and clay and loams in exceptional quantity were carried into the estuaries by the ice-foes and waters; but in the Nomini area the subsidence was such as to flood only the lower lands. By these freshets and the tidal currents of the estuaries the Columbia deposits were accumulated and the broad terraces flanking the Rappahannock, Poto- mac, and Patuxen rivers were built.

In the last stage of the history clearly recorded by the Potomack-Potomac formation, the land remained above water, and the coastal Plain began to form, which lushing was followed by slight subaqueous, which merged into the present sinking of the Coastal Plain.

ECONOMIC PRODUCTS.
The principal mineral products of the Nomini region consist of marl, fuller's earth, brick, clay, pottery clay, building stones, sand, quartz gravel, and sand and gravel.

Marl—The most important mineral resource in the area of the Nomini sheet is marl, large deposits of which are found in the Patuxen and Chesapeake formations. The Potomack formation consists in greater part of marl, and the shells which form the biogenous material in the Chesapeake formation are of considerable extent and thickness. These marls contain lime and pectin in small percentages, and usually also some phosphoric acid. They are of great value for enriching land, and especially for restoring the fertility of worn-out soils. They have not been extensively used in the region, but a number of farmers have tested their efficiency with most satisfactory results. In addition to the marl deposits in the Coastal Plain province they are in general use and their great value is fully recognized. This is particularly the case in New England, where the marls are dug in large amounts for local use and are to some extent shipped to points outside of the marl belt. The marls are in general very profitable and as the economical fertilizers, but their effect is gradual and more lasting and they do not ultimately change the soil. Certain chemical analyses have been made in recent years for times for several years, and the land will bear many successive treatments. As the marls underlie many portions of the region and are easy to excavate, the expense attending their use is very small compared with the benefit to be derived from them. All sandy soils and nearly all crops have been found to be benefited by marls. Grasses, grain, and corn are particularly subject to its influence and in many cases marl has been found to yield stress from 20 to 50 per cent more after over spreading the soil lightly with marl.

While rivers continually contain grains of the dark-green glauconite (which consists in part of pectin), with more or less carbonate of lime and as shells. There is a common chemical admixture of clay. The Chesapeake marl consists largely of clay, shells, and glauconite. The Potomack marls vary considerably in strength, but rich glauconite shell marls abound in the formation, particularly in the vicinity of the Taconic River.

More or less highly glauconite shell marls are exposed in the cliffs of the lower Potomac, and are probably the most important in the formation.

Shell marls of the Chesapeake formation are of frequent occurrence in Westmoreland, Richmond, St. Mary, and Calvert counties. It is dug in moderate amount from the Nomini Cliffs near the
mill just north of Stratford, and mixed with other fertilizers, both for shipment and for local use. Nearly all the shell deposits which abound in the formation are useful for fertilizing land, and they usually contain, in addition to the shells, more or less calcareous material and glassmont. They may be looked for in nearly every gully in the Chesaapeake area in the counties mentioned. In selecting shell, it should be remembered that the beds containing the largest proportions of shells and grains of the dark, bottle-green mineral, glassmont, are richest in plant food.

**Fillers' sand.**—Eastward in the Chesaapeake formation the beds of infusorial or diatomaceous remains are often sufficiently pure for commercial use as "fillers' sand." The largest deposits are near the base of the formation, and they are best exposed in the bluffs along the Potomac at the mouth of Popes Creek, Maryland, where at one time they were worked for shipment. The deposits underlie the western part of Westmoreland, Richmond, and St. Mary counties and the southeastern part of Charles County, and they are exposed at many points along streams and road-cuts. The purity of the material is diminished in some portions of the district by admixture with clay or sand, but even over much of the area there are large supplies of relatively pure deposits.

**Brick clays.**—The loams of the Columbia formation, and to a less extent those of the Lafayette formation, are used locally for brickmaking. The deposits are nearly coextensive with the formations, and they are generally well adapted for brickmaking. The Columbia loam is especially valuable for this purpose, as shown by experience in neighboring states. Washington and Baltim ore are largely built of bricks made from this deposit; and in Philadelphia and Trenton the same material (locally known as Philadelphia brick clay) is extensively developed, and is largely used in those and neighboring cities. The loam forming the terraces of the Rappahannock, Potomac, and Patuxent rivers is in most cases adapted to the manufacture of ordinary and pressed bricks, and is practically unlimited in quantity.

**Pottery.**—Some of the clays in the Chesaapeake formation in the central and eastern portion of the Nomini tract are probably of the proper character for the manufacture of pottery, tile, and terra-cotta, but so far as known they have not been tested.

**Building stone.**—The only rocks in the tract are occasionally sandy ironstone streaks in the Gloucester formation and a local silicious bed in the Chesaapeake formation. Both are used for foundations and rough work. The ironstone occurs on or near the surface at many places on the Lafayette "ridges," but seldom affords large blocks. The silicious layer in the Chesaapeake formation is found along both sides of the Patuxent below Jones Wharf and touchscreen Island.

**Sand.**—The lower or middle beds of the Columbia formation are made up largely of sand, which is frequently of such character as to excel as building sand. Building sands are also found locally in the lower part of the Lafayette formation. The Lafayette sands often require screening, but after passing through this process they are usually excellent, consisting of sharp grains of firm quartz; such sand is highly valued among the builders in neighboring cities. Molding sand of good quality is found in the Chesaapeake in the adjacent portions of the Coastal Plain, and will doubtless be a useful resource in the Nomini tract.

**Gravel.**—The gravel beds found in the Lafayette and Columbia formations are a rich source of most excellent material for roadmaking and railway ballasting and their use can not be too strongly advocated. The well-rounded quartz pebbles are easily handled and transported, and are practically indestructible.

**Underground water.**—In that portion of the Coastal Plain area which is shown on the Nomini sheet the water supplies are mainly derived from shallow wells, springs, and surface streams. Where there is no contamination from ditches, barnyards, and other similar sources of impurity the waters are often of satisfactory quality, but it is probable that much of the malaria so prevalent in the lower lands is attributable to waters on or near the surface. In many places in eastern Virginia and Maryland wells have been sunk to deepen-seated waters, and it is found in most cases that a marked diminution in malarial diseases has resulted. These deep-seated waters underlie all of the area of the Nomini sheet, at several horizons, at depths which vary from 100 to 200 feet. Some of these waters have been reached by wells at Colonial Beach, Rock Point, Bushwood, Oakley, Leonardtown, Kinsale, Coles Point, Ragged Point, Sandy Point, Piney Point, and near Sotterly, at depths of from 160 to 300 feet. The principal horizons are in the Chesaapeake and Patuxent formations, and consist of coarse sands and gravel in thin but widely extended sheets which dip gently eastward. Lower horizons probably also underlie the entire region, but their easterly dip has carried them far beneath the surface and no wells have been sunk to them. In the artesian-well sheet of this folio these sheets are shown the location and depth of the wells and the depth to the three principal water horizons. The depths to these horizons are indicated by underground contour lines which show the direction and rate of slope of the water-bearing beds. From these lines approximate depth of the waters below sea-level may be quite closely ascertained for any given point. It should be borne in mind in calculating depths that the amount of surface relief, as indicated by the brown topographic contour lines, should be added to the estimate of the depth below sea-level.

Along the western margin of the tract the waters at the base of the Patuxent formation will be found most serviceable. They yield the flows in the deeper wells at Colonial Beach and in the well at Chapel Point, Maryland. They slope nearly due eastward at the rate indicated by the pair of underground contour lines shown on the artesian-well sheet. The next higher water-bearing horizon is in sands which along Potomac River lie at an average of about 50 feet above the land beds, the amount increasing gradually northward. These sands yield water at Colonial Beach at a depth of 100 feet, at Rock Point at 354 feet, at Bushwood at 287 feet, and at Oakley at 305 feet. They have not been reached by wells farther eastward. Their rate and direction of slope, and their depth for each 50 feet, are indicated by the second set of underground contour lines—heavy, full lines—on the artesian-well sheet. The basal sands of the Chesaapeake formation lie about 500 feet above the Patuxent horizon. They are tapped by the wells at Leonardtown, Piney Point, Rock Point, Coles Point, Sandy Point, Kinzol, and near Sotterly. Their direction and rate of dip, and depth below mean tide-level for each 50 feet, are shown by the third set of underground contour lines on the artesian-well sheet.

The head or pressure of the water of these various horizons is sufficient to afford flowing wells only in the lowest lands of the Nomini area. Along Potomac River the water rises 10 to 16 feet above mean tide-level in greater part, but at Rock Point it is reported to rise about 24 feet above tide. On Patuxent River, so far as yet developed, the height to which the waters will rise is considerably less than in any of the wells on the Potomac. The area that is sufficiently low to be within reach of artesian flows is shown approximately on the artesian-well sheet by a distinctive tint. The underground waters extend under the higher land, where, in many cases, they will no doubt be found available through pump wells.

At the base of the Columbia and Lafayette deposits there are widely extended beds of gravel and coarse sands, which furnish water to hundreds of shallow wells. The supply at the base of the Columbia formation, which occurs at low levels, is particularly abundant; while wells finding their supply at the base of the Lafayette are notably persistent. The ground waters of both of these horizons are of great importance to the people of the Nomini tract; yet precaution is necessary in utilizing them, since beds are particularly liable to surface contamination. The Lafayette deposits are chemically stable and moderately porous, and water passing through them is filtered mechanically, but is not necessarily freed from organic impurities; and in some what less degree the same is true of the Columbia deposits. Wells taking water from these deposits are safe only when remote from houses, barns, stock-yards, privies, and other possible sources of contamination.

W. H. DUTTON,
Geologist.

April, 1896.
in tunnels and channels in the ice, and forms characteristic ridges and mounds of sand and gravel, known as sastrugi, or sastrugi, and kames. The material deposited by these glaciers, called glacial drift; that washed from the ice onto the adjacent land is called modified drift. It is used also to chart as surficial rocks, as they are deposited by streams of lakes and rivers that were made at the same time as the ice deposit.

**MORPH OF ROCKS.**

Rocks are further distinguished according to their relative ages, for rocks were not formed all at once, but from time to time in the earth's history. Classification by age is independent of origin; igneous, sedimentary, and metamorphic rocks may be of the same age.

When the predominant material of a rock mass is essentially the same, and it is bounded by rocks of different materials, it is convenient to call the mass throughout its extent a formation, and such a formation is the unit of geologic mapping.

Several formations considered together are designated a system. The time taken for the deposition of a formation is called as, and the time taken for that of a system, or some larger fraction of a system, a period. The rocks are mapped by forms of rocks on which the same age is continuously classified into systems. The rocks composing a system and the time taken for its deposition are given in the same scale, for instance, Cambrian system, Cambrian period.

As sedimentary deposits or strata accumulate the youngest strata are at the top and the relative ages of the deposits may be discovered by observing their relative positions. This relationship holds within regions of intense disturbance; sometimes in such regions the boundaries of the beds have been so great that their position is reversed, and it is often difficult to determine the relative ages of the beds from their positions; then fossils, or the remains of plants and animals, are a guide which show which of two or more formations is the oldest.

Strata often contain the remains of plants and animals which lived in the sea or were washed from the land into lakes or seas or were buried in surficial deposits on the land. Rocks that contain the remains of life are called fossiliferous. By studying those remains, or fossils, it has been found that the species of each period of the earth's history have to a great extent differed from those of other periods. Only the simplest kinds of marine life existed when the oldest fossiliferous rocks were deposited. The number of kinds is time more complex kinds developed, and as the simpler ones were modified forms became more varied.

The fossils, or remains of dead organisms, are collectors of the same species of the present day and are often classified by families and genera, a process that is time more complex kinds developed, and as the simpler ones were modified forms became more varied.

**The various geographic sheets.**

Areal sheet.—This sheet shows the areas occupied by the formations. On the margin is a legend, which is the key to the map. To accurately correlate the areal sheet with the character of the strata and the letter-symbols on the map the reader should look for that color, pattern, and symbol in the legend corresponding to the description of the formation. If it does not find any such color, symbol or letter, the map shall not be valid and the map cannot be traced out.

The legend is also a partial statement of the areal geographic history. The formations are arranged according to origin into surficial, sedimentary, and igneous, and within each class are placed in the order of age, so far as known, the youngest at the top.

Oceani-ocational sheet. This sheet shows the areas occupied by the formations. On the margin is a legend, which is the key to the map. To accurately correlate the areal sheet with the character of the strata and the letter-symbols on the map the reader should look for that color, pattern, and symbol in the legend corresponding to the description of the formation. If it does not find any such color, symbol or letter, the map shall not be valid and the map cannot be traced out.

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**AVARIAL SYSTEM.**

The plateau in fig. 3 presents toward the lower land an escarpment, which is made up of sandstones, forming the cliffs, and shales, forming the hills and cliffs, as shown at the extreme left of the section.

The broad belt of lower land is traversed by several ridges which rise in the section correspond to beds of sandstone that rise to the surface. The uppermost edges of these beds form the ridges, and the intermediate valleys follow the contour of the low and continuous shadows.

The average thickness of each formation is shown in the column, which is drawn to a scale—usually 1,000 feet to 1 inch. The order of accumulation of the sediments is shown in the column arrangement: the oldest formation is placed at the bottom of the column, the youngest at the top, and the sequence of the layers, when present, are indicated in their proper relations.

The formations are combinations of systems which correspond with the sequences of the geologic history. Thus the ages of the rocks are shown, and also the total thickness of each system.

The interval of time which correspond to events of uplift and depression and constitutes intercalations of deposition of sediments may be defined as the word "conformity," printed in the columnar section.

Each formation shown in the columnar section is indicated by a letter symbol for its character, and its letter symbol as used in the maps and their legends.

**CHARLES D. WALcott.**

Director.

Revised July, 1895.