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The Surface Configuration of Maryland.

BY WILLIAM B. CLARK.

The close relationship which exists between the climate and the topography of a country has been recognized by all students of climatology. Certain striking differences are shown in the surface configuration of Maryland which intimately affect the temperature, rainfall, and direction of the winds, in its various portions. For a full comprehension of the climate of the State, therefore, it will be necessary to examine, somewhat in detail, its chief topographic features. They will be best understood after a brief account of the eastern United States,* since Maryland is only a portion of a larger and definite topographic region.

An examination of a relief map of the United States shows a gradual elevation east of the Mississippi Valley to the great mountainous area bordering the eastern side of the continent, beyond which the country slopes at first rapidly, then gradually, to the Atlantic coast.

The mountainous area is known under the name of the *Appalachian Region*, while the hilly country which stretches along its eastern base has been called the *Piedmont Plateau*. To the east of the latter, and occupying the region bordering the Atlantic coast, is a low, level area which has been termed the *Coastal Plain*.

A brief characterization of these leading topographic divisions of the eastern United States will precede a more detailed description of the Maryland area.

The Coastal Plain, as a continuous tract, begins in New Jersey on the south shore of Raritan Bay,

where it has a width of about 20 miles, and extends thence southward, constantly broadening, until in Georgia it reaches fully 150 miles. North of New Jersey it is continued in the islands of Long Island, Martha's Vineyard, and Nantucket, and other land areas bordering the New England coast.

The Coastal Plain is characterized by broad, level stretches of slight elevation, cut by the larger rivers that flow across the area from the Piedmont Plateau, and the smaller rivers and tributaries that have their sources within it. All the streams have sluggish currents, and the drainage of the land is imperfect. Throughout, the country is deeply indented with tidal estuaries and bays, the heads of which often reach quite to the border of the Piedmont Plateau, and at many points admit of the entrance of the largest ocean-going vessels. The deeper channels are generally the continuation of the leading rivers, which suddenly change in character as they enter the Coastal Plain, with great loss in the velocity or their currents. The name "fall-line" has been given to this boundary on that account.

The inland border of the Coastal Plain marks the head of navigation, and has likewise conditioned, from the earliest times, the leading highways of trade which connect the North and the South. Along this line have grown up the larger cities of the Atlantic seaboard. Trenton, Philadelphia, Baltimore, Washington, Richmond, Petersburg, Columbia, Augusta, together with other less populous centers, are thus situated.

To the west of the Coastal Plain, and extending to the base of the mountainous area, is a region of somewhat greater elevation than that which has just been described. It is known under the name of the Piedmont Plateau.

* See Whitney, J. D.: United States. Physical Geography and Geology. Encyclopedia Britannica, vol. xxiii, pp. 791-802.
McGee, W. J.: Three Formations of the Middle Atlantic Slope. Amer. Jour. Sci., 3rd ser., vol. 35, pp. 120-124.

To the north, in New England, it is less clearly defined than along the Middle and South Atlantic slope, where it occurs as a broken, hilly country, with undulating surface, but with few ranges of mountains of conspicuous altitude or great extent. It broadens from New York southward, reaching its greatest width in North Carolina, where it extends quite 300 miles from the base of the Appalachian Mountains. Throughout most of the Piedmont Plateau the streams flow with rapid currents, and the country is fully drained.

The area of highland, known as the Appalachian Region, extends from Cape Gaspé, in Canada, southward to Alabama, a distance of 1300 miles. To the south of New York it is divided into three more or less clearly defined regions.

The eastern district is composed of ranges of mountains called in Pennsylvania the South Mountains, but known in Maryland, Virginia, and North Carolina under the name of the Blue Ridge. South of Virginia the eastern belt increases in width, and somewhat changes its character, and in North Carolina contains the highest points in the whole Appalachian system. On the western border of the Blue Ridge lies the Great Valley, which, in Pennsylvania, is about 10 miles in width, but broadens southward, attaining in Virginia, for a distance of 300 miles, a nearly uniform width of 20 miles. It forms one of the richest agricultural belts within the Appalachian Region.

The central district is known as the Appalachian Region proper, and is characterized by parallel ranges throughout the whole length of the mountainous area. The continuity of the ranges is frequently interrupted from structural and other causes, but sharp ridges and deep valleys everywhere abound.

The western district is characterized by undulating ranges which rise from a high plateau that gradually decreases in elevation westward, until it merges into the rolling country of the Mississippi Valley. Along the eastern side of this western area of highland are the Alleghany Mountains. They continue as parallel ranges throughout the region which is commonly known as the Alleghany District.

After this review of the leading topographic features of the eastern United States, let us turn our attention to a consideration of the Maryland area.

The three regions which have been outlined above, viz. the Coastal Plain, the Piedmont Plateau, and the Appalachian Region, are all typically represented within the limits of the State of Maryland, and have conditioned, to a marked extent, its economic development.

THE COASTAL PLAIN.

The Coastal Plain forms the eastern portion of the State, and comprises the area between the

Atlantic Ocean and a line passing N. E. to S. W., from Wilmington to Washington, through Baltimore. This region includes very nearly 5000 square miles, or, approximately, one-half the area of the State. It is about 100 miles broad in its widest part.

The Coastal Plain is characterized by broad, level-topped stretches of country, which extend, with gradually increasing elevations, from the coastal border, where the land is but slightly raised above sea-level, to its western edge, where heights of 300 feet and more are found. As the region is cut quite to the border of the Piedmont Plateau with tidal estuaries, the topography becomes more and more pronounced in passing inland from the coast. The Chesapeake Bay extends nearly across its full length from north to south, while the larger rivers and their tributaries deeply indent the region in all directions, making the coast-line in Maryland one of the longest in the country.

The Coastal Plain, in Maryland, may be divided into a lower eastern and a higher western division, separated by the Chesapeake Bay. The former is known under the name of Eastern Maryland (or Eastern Shore), while the latter is commonly referred to as Southern Maryland.

The *eastern division* includes the counties of Worcester, Somerset, Wicomico, Dorchester, Caroline, Talbot, Queen Anne, Kent, and part of Cecil. To this region most of the State of Delaware, also, properly belongs. Nowhere, except in the extreme north, does it reach 100 feet in elevation, while most of the country is below 25 feet in height. Both on the Atlantic coast and the shore of the Chesapeake it is deeply indented by bays and estuaries.

The drainage of the region is simple, the streams flowing from the watershed directly to the Atlantic Ocean and Delaware Bay upon the east, and to the Chesapeake Bay upon the west. The position of the watershed, along the extreme eastern edge of the area, is very striking. In Worcester county, for much of the distance, it is only a few miles from the coast. As a result, the streams which flow to the east are small in comparison to those which drain to the west. Among the more important rivers which reach the Chesapeake Bay are the Pocomoke, Nanticoke, Choptank, and Chester, all of which have their headwaters within the State of Delaware, and flow in a general southwest direction in sinuous channels.

The *western division* includes the counties of St. Mary's, Calvert, Charles, Prince George's, Anne Arundel, and portions of Baltimore, Harford, and Cecil. In elevation it stands in striking contrast to the eastern division, since it frequently exceeds 100 feet in height, even along its eastern margin. In lower St. Mary's county the land reaches an elevation of 100 feet not far from the

Bay shore, which is gradually increased until, near the border of Charles county, the region slightly exceeds 180 feet. In southern Calvert county an elevation of 140 feet is found to the west of Cove Point, and this gradually increases to the northward, until near the southern boundary of Anne Arundel county the land rises above 180 feet. Farther to the northwest, in Charles, Prince George's and Anne Arundel counties, the land increases gradually in height, reaching 280 feet to the east of Washington, and this is continued with slight decrease to the northeastward toward Baltimore.

The western division is traversed by several rivers which flow from the Piedmont Plateau. Among the more important are the Potomac, Patuxent, Patapsco, Gunpowder, and Susquehanna. The course of the Potomac is very striking. After flowing in a nearly southeast direction, across the hard rocks of the Piedmont Plateau, it is, apparently, abruptly turned aside by the soft materials of the Coastal Plain, and takes a course for 40 miles nearly at right angles to that which it has formerly held. It turns again as abruptly to the southeast, and flows in that direction to the Chesapeake Bay.

The local drainage of the western division is similar to that hitherto described for the eastern. The streams throughout southern Maryland flow chiefly to the westward. The watershed of the region lying between the Chesapeake Bay and the Patuxent River is situated but a short distance from the shores of the latter, most of the natural drainage of Calvert county reaching the Patuxent River. A still more striking instance of this is seen in St. Mary's, Charles, and Prince George's counties, where the streams nearly all flow to the Potomac River, the watershed of the region approaching very close to the valley of the Patuxent. The same peculiarity of drainage is found to the southward, in Virginia and the Carolinas.

THE PIEDMONT PLATEAU.

The Piedmont Plateau borders the Coastal Plain upon the west, and extends to the base of the Catoctin Mountain. It includes, approximately, 2500 square miles, or about one-fourth of the area of the State. It is nearly 40 miles in width in the southern portion of the region, but gradually broadens toward the north, until it reaches 65 miles. It includes all, or the greater part of Montgomery, Howard, Baltimore, Harford, Carroll, and Frederick counties. The country is broken by low, undulating hills, which gradually increase in elevation to the westward.

The Piedmont Plateau, in Maryland, is divided very nearly in its central portion by an area of highland known as Parr's Ridge, into an eastern and a western district. In the character of the rocks these divisions afford sharp distinctions, which are not without their effect upon the relief of the land.

The *eastern division* has, on account of its crystalline rocks and their complicated structure, a diversified topography. Along the eastern margin the land attains, at several points, heights exceeding 400 feet, reaching at Catonsville 525 feet above sea-level. To the west the country gradually increases in elevation, until it culminates in Parr's Ridge, which exceeds 850 feet in Carroll county.

The drainage of the eastern district is to the east and southeast. On its northern and southern boundaries it is traversed by the Susquehanna and Potomac rivers, which have their sources without the area, while the smaller streams, which lie between them, either drain directly to the Chesapeake Bay or into the two main rivers. Among the larger of the intermediate streams are the Patuxent, Patapsco, and Gunpowder rivers, whose headwaters are situated upon Parr's Ridge. The Patapsco, especially, flows in a deep rocky gorge until it reaches the Relay, where it debouches into the Coastal Plain. All these streams have rapid currents as far as the eastern border of the Piedmont Plateau, and even in the case of the largest rivers are not navigable.

The broad, fertile limestone valleys are a striking feature in this area, and are represented to the north of Baltimore in the Green Spring and Dulaney's valleys. On account of the complicated character of the stratigraphy, the valleys take different directions and are of different form and extent.

The *western division* extends from Parr's Ridge to Catoctin Mountain. Along its western side is the broad limestone valley in which Frederick is situated, and through which flows the Monocacy River from north to south, entering the Potomac River at the boundary line between Montgomery and Frederick counties. The valley, near Frederick, has an elevation of 250 feet above tide, which changes slowly to the eastward toward Parr's Ridge, and very rapidly to the westward toward Catoctin Mountain. Situated on the eastern side of the valley, just above the mouth of the Monocacy River, and breaking the regularity of this surface outline, is Sugar Loaf Mountain, which rises rapidly to a height of 1250 feet.

With the exception of a few streams which flow into the Potomac directly, the entire drainage of the western district is accomplished by the Monocacy River and its numerous tributaries, which flow in nearly parallel west and east courses, from Parr's Ridge and the Catoctin Mountain. As the deepest portion of the valley lies considerably to the west of the center of the district, the streams upon the east are longer and of greater volume than those upon the west. The waterways at a distance from the main valley flow in well-marked channels which are frequently deeply cut into the land.

THE APPALACHIAN REGION.

The Appalachian Region forms the western portion of Maryland, bordering the Piedmont Plateau. It comprises about 2000 square miles or, approximately, one-fifth the area of the State. It includes the western portion of Frederick, and all of Washington, Alleghany and Garrett counties. It consists of a series of parallel mountain ranges with deep valleys, which are cut nearly at right angles by the Potomac River. Many of the ranges exceed 2000 feet, while some reach 3000 feet and more, in the western portion of the mountainous area.

The Appalachian Region is divided into three distinct districts, an eastern (Blue Ridge and Great Valley), a central (Appalachian Mountains proper), and a western (Alleghany Mountains), which are separated from one another upon clearly defined structural differences.

The *eastern division* comprises the area between the Catoctin and the North Mountains, and has a width of about 25 miles from east to west. Along the eastern border of this region the Catoctin Mountain extends from north to south, reaching the Potomac River at Point of Rocks. It attains an altitude of 1800 feet. Succeeding this range upon the west is the Middletown Valley, with an elevation of 500 feet at Middletown. Running through its center from north to south is the Catoctin Creek, which receives the drainage from the western flanks of the Catoctin Mountain and the eastern slope of the Blue Ridge. The Blue Ridge Mountains are a continuation of the South Mountains of Pennsylvania, and extend as a sharply defined range from the northern boundary of the State to the Potomac River, which they reach at Weverton. Their crest forms the boundary between Frederick and Washington counties. The Blue Ridge reaches an elevation of about 2400 feet at Quirauk. The Blue Ridge of Virginia is not the direct continuation of the mountains so named in Maryland, but of a smaller range, the Elk Ridge Mountains, that adjoin them upon the west. They are pierced by the Potomac River at Harper's Ferry.

Occupying the greater part of this eastern district, and reaching to its western border, is the Hagerstown Valley, a portion of the Great Valley of the Appalachian Region hitherto described. It reaches an altitude of about 500 feet at Hagerstown, but gradually becomes lower toward the south in the vicinity of the Potomac River. The Antietam River and its tributaries occupy the eastern side of the valley, and the Conococheague River and its tributaries the western. The central portion of the valley is accordingly somewhat higher than its sides.

The *central division*, which comprises the Appalachian Mountains proper, is bounded by the North Mountain upon the east, and Will's

Mountain near Cumberland upon the west. Prof. H. D. Rogers describes this district as follows in his report of the First Geological Survey of Pennsylvania:—"It is a complex chain of long, narrow, very level mountain ridges, separated by long, narrow, parallel valleys. These ridges sometimes end abruptly in swelling knobs, and sometimes taper off in long slender points. Their slopes are singularly uniform, being in many cases unvaried by ravine or gully for many miles; in other instances they are trenched at equal intervals with great regularity. Their crests are, for the most part, sharp, and they preserve an extraordinarily equable elevation, being only here and there interrupted by notches or gaps, which sometimes descend to the water-level, so as to give passage to the rivers [Potomac]. . . . The ridges are variously arranged in groups with long, narrow crests, some of which preserve a remarkable straightness for great distances, while others bend with a prolonged and regular sweep. In many instances two narrow contiguous parallel mountain-crests unite at their extremities and enclose a narrow oval valley, which, with its sharp mountain sides, bears not unfrequently a marked resemblance to a long, slender, sharp pointed canoe." Among the more important of the ranges in Maryland, west of North Mountain, are Tonoloway Hill, Sideling Hill, Town Hill, Green Ridge, Warrior Ridge and Martin's Ridge, the two latter reaching 2000 feet and upwards in elevation. They are arranged in groups of three parallel and closely adjoining ridges on the east and west, with more distant ranges in the middle of the district.

The drainage is altogether to the southward into the Potomac. The deeper valleys in the eastern portion of the region have an elevation of about 500 feet in the vicinity of the Potomac, but they gradually become higher toward the west. Evett's Creek at its mouth, near Cumberland, has an elevation of about 600 feet above sea-level.

The *western division* occupies the extreme western portion of Maryland, and includes the Alleghany Mountains in its eastern half. They gradually merge into a high plateau, with gently undulating mountains rising from the surface, which continue beyond the western borders of the State. The leading ranges of this district are Dan's Mountain, Savage Mountain, Meadow Mountain, Negro Mountain, Winding Ridge and Laurel Hill. Heights of 3000 feet and more are reached in Savage and Negro Mountains.

The partially adjusted streams give much variety to the topography. They flow in part to the southward into the Potomac, but in Garrett county the greater number drain to the northward through the Youghiogheny River into the Monongahela.

This separation of the drainage has particular interest, since it marks the watershed between

the streams which flow into the Potomac and thus reach the sea by the eastern slope of the Appalachian Mountains, and those which flow to the Gulf by way of the Ohio and Mississippi rivers.

Letters.

WHY WATER REMAINS FROZEN IN A TEMPERATURE BELOW FREEZING. ANSWER TO LETTER IN PREVIOUS ISSUE.

Permit me to suggest an answer to Prof. G. G. Curtiss's inquiry in your bulletin for January, 1893: "Why does water remain unfrozen at a temperature far below freezing?" The idea occurred to me in 1888, while I was stationed at La Crosse, Wisconsin. On the 21st of January, 1888, the temperature at La Crosse, at the morning observation, was 42 degrees below zero, and a mist, or fog, prevailed so dense that houses across the street could hardly be distinguished. At the same time, of course, everything was thickly covered with frostwork.

It is well known that water in a capillary tube does not freeze at temperatures considerably below 32 degrees. I suppose that the particles of a mist, or fog, do not freeze for the same reason—they are so extremely minute. We may suppose that the smallest crystal of ice cannot be formed out of less than a certain number of molecules of water. Each fine particle of mist may not have a sufficient number of molecules to enable the arrangement constituting an ice-crystal to be formed. Freezing, therefore, will not take place until a number of particles have conglomerated.

C. F. von Herrmann,

Observer, Weather Bureau.

NORTH CAROLINA STATE WEATHER SERVICE,
RALEIGH, N. C.

THE STORM OF FEBRUARY 19TH, 1893.

In my recent report I gave no account of the great damage done in Westminster and vicinity by the February storm, deeming it unnecessary for the reason that all of that matter had been published in our three county papers and in at least one of the Baltimore weeklies. Without itemizing, it would, perhaps, have been worth while to have said that the storm did more damage to property in Westminster than all other storms put together since the town was started, in the early part of the present century. Such appears to be the truth from the best accounts of the past that are now obtainable. *Jno. T. Cassell.*

WESTMINSTER, MD.

Miscellaneous Notes.

ON March 10th, 1893, Annapolis was established as a special display station of the Weather Bureau, repeating Baltimore warnings. The displays will be under the supervision of Mr. Wm. M. Abbott, editor of the *Evening Capital*.

Observers will confer a special favor by promptly forwarding meteorological forms. Each month, the issue of this publication is somewhat delayed by the tardy arrival of a few monthly reports.

Review of the Month—February.

WEATHER.

General Remarks.—In Maryland, the District of Columbia, and Delaware, the month was somewhat colder than the average February, and there was a greater amount of precipitation than usual; still, the variation from the normal, in either particular, was not at all exceptional. In 1889 it was considerably colder, and in several previous years the mean temperature was lower. There was about an equal amount of precipitation in 1890, and the records show much larger amounts in a number of earlier seasons.

A principal immediate cause of non-periodic temperature and precipitation variations exists in the changing relationship of the given territory to the areas of low and high atmospheric pressure which pursue each other around the globe. The movements of the areas are nearly always easterly, and therefore it is to the west that we, as a rule, look for our weather. But some one will say, "That cannot be, for it is the east wind that blows us nearly all of our bad weather, while the west wind does not often bring anything but good." The explanation is best made with an example. At 8 P. M., February 2nd, 75th meridian time, there was central very near Chicago an area of low pressure—a storm. How was this known? At 8 P. M., February 2nd, 75th meridian time, an 'observation' was taken at each of 123 U. S. Weather Bureau stations, and the results were telegraphed to Washington. The first instrument read at each station was the barometer, which gave the weight of the atmosphere in inches of mercury, the reading, in each case, being reduced to sea-level, to make it comparable with the readings taken at the other stations. The lowest barometer, about 30.0, was at Chicago, also at Milwaukee, and the isobar of 30.0 was drawn on the weather map around these two places, the word "low" being written between them. At La Crosse, Davenport, St. Louis, Memphis, Cairo, Cincinnati, Toledo, and Detroit, the barometer read about 30.1, and the isobar of 30.1 was drawn through these places, making a circular line without the isobar of 30.0. Still further from the center, according to the reading of the barometer, was drawn the isobar of 30.2, then 30.3, and 30.4. The limit of a storm is reached when the isobars are no longer concentric, and take new directions, according to the influence of other areas, either high or low. This storm was about 800 miles in diameter. The small difference, .4, between the center and the rim of the storm does not seem so

slight when we reflect that .1 inch of mercury equals about 100 feet of air at the surface of the earth. Thus we see that the air is heaped up about the center of lowest pressure, and, obeying the force of gravity, flows toward this center. If you will look at the weather map of 8 P. M., February 2nd, you will see the arrows, indicating the direction of the wind at the various stations within the storm, pointing toward the storm center. If the storm is to the westward of a place, within its rim, the wind at that place will be from an easterly direction (a bad weather direction), *i. e.*, the wind flows toward the storm-center, and as the storm travels, the wind-vanes at the stations coming successively within its borders, turn and show that the air has begun to move toward the center. This explains why, when the wind is in the east, the storm is in the west.

Then comes the question, "Why does not the depression fill up?" If you will look again at the arrows, you will notice that they are generally inclined to the center, showing a circular as well as an inward movement of the atmosphere. The storm is really an aerial whirlpool, and there is a heaping up at its rim, as in the case of water stirred about in a basin. You will notice that on the east side of the storm-center the wind is southerly, while on the west it is northerly; therefore, the air in the whirlpool moves about the center opposite to the direction of the hands of a watch held face upward. This is true for all the low area storms of the northern hemisphere. The wind blows from right to left, in front of you, when you stand at the center of the storm, from the influence of the earth's rotation. Air drawn from the north goes down on the left of the storm-center, because it retains quite nearly the velocity of the earth's surface from whence it started, and is thus left behind as it passes over the more and more rapidly moving surface to the southward. Air from the south goes up on the right, because it also retains a large measure of the velocity of the surface further south, and therefore gets ahead of the less rapidly moving surface to the northward. But if the air moves toward the center and the pressure there still remains low, what becomes of this inflowing air? It cannot go down, so it must go up. It does go up, and here comes in the cause of the rainfall. The air from the south is, as a matter of course, comparatively warm. Being warm, it has taken up more moisture (and thus become lighter) than it otherwise would have done, and this is especially the case if it has passed over large bodies of water. Coming under reduced pressure as the center is approached, this warm, moist air rises, expands, cools and loses a portion of its moisture, from condensation, *i. e.*, rain, or some other form of precipitation, occurs, latent heat is liberated, and the air goes on rising and expanding and cooling till it has an opportunity to flow off on either side. Thus occurs the precipi-

tation of the storm. The supply of air drawn from the north is, relatively, cold and dry. Cold condenses the moisture of the atmosphere and causes contraction. The moisture of the atmosphere is lighter than the permanent constituents. Cold air, then, is dry and heavy, and seeks the surface of the earth. Thus, as this air comes down on the west of the storm, there is where the weather is cold, and as the warm air goes up on the east side, there is where the weather is warm. The isotherms, the dotted lines of the weather map, show this, rising northward as they approach from the east, and dropping southward after passing to the westward of the center.

The weather map of 8 A. M., February 3rd, shows the storm, above mentioned, as central near Oswego, N. Y., a movement of about 750 miles in 12 hours. It continued to move at this rate, and disappeared to the northeast on the 4th, throughout its traceable course being (as is the general rule) preceded by relatively warm weather and rain or snow, and followed by relatively cold weather without the precipitation. During the month ten of these low storm areas moved easterly over the country, and all of them to a greater or less extent influenced the weather of this section. Each storm was preceded and followed by areas of high pressure, more or less distinctly defined.

The areas of high pressure have been described as rounded atmospheric waves. They have a center of greatest pressure, and the air flows spirally out of them, as it flows spirally into the lows; but in an opposite direction, *i. e.*, on the east of the area, the winds are northerly, and on the west, southerly; this movement is caused, also, by the earth's rotation. The coldest weather accompanies the eastern half, which is, of course, just in the rear of the low storm area.

There were, during February, eleven of these high area visitors to this region. Their general movement was from the northwest; but a number of the low areas came from the southwest.

The map, p. 93, shows the differences between the mean temperatures of the different sections, varying all the way from the isotherm of 24° in Western Maryland to the one of 37° across the lower portions of Southern Maryland, Eastern Maryland, and Delaware. The map also shows, as regards precipitation, that it was above 2 inches at every station, and more than 4 inches over Delaware and the District of Columbia and the greater portion of Maryland. The table of Daily Precipitation indicates the distribution throughout the month to have been quite even. While the precipitation of the month consisted largely of snow, the high winds drifted it so badly that it afforded rather poor protection to crops. The most favorable report, in this particular, was received from Delaware. Fuller particulars may be found under the heading "Crops."

Precipitation (in inches).—Average, 4.23; greatest amount, 5.45, at Woodstock; least amount, 2.22, at Jewell. The greatest fall of snow during the month, in Maryland, 22 inches, is reported by the observer at Sunny Side, Garrett Co. The next greatest fall, 21 inches, was at Boettcherville, Alleghany Co. Cumberland, close by, reports 20 inches. The least fall, 1.5 inches, is reported by the observer at Leonardtown, St. Mary's Co. Baltimore reports 11.7.

Temperature (degrees).—Mean monthly (for entire territory covered), 33.3; highest mean monthly, 38.9, at Cambridge; lowest mean monthly, 24.4, at Sunny Side. Highest temperature, 70, at Denton; lowest temperature, 5 below zero, at Boettcherville, on the 21st. Greatest local monthly range, 63, at Boettcherville; least local monthly range, 43, at Salisbury. Mean monthly range, 52.4. Mean maximum temperature, 42.3; mean minimum temperature, 26.4.

Wind.—Prevailing direction, northwest. Total movement in miles, Baltimore, 6628; Norfolk, Va., 7470; Washington, D. C., 5877. A severe wind storm occurred in Maryland on the 19th, the full particulars of which are given in the "Notes by Observers."

Hail.—At Barron Creek Springs, on the 11th, 12th, 17th, 27th; at Fenby, on the 28th; Glyndon, on the 6th, 9th, 21st, 28th; at McDonogh, on the 28th; at Millsboro, Del., on the 11th, 17th; at Mt. St. Mary's, on the 28th; at New Market, on the 5th, 17th, 28th; at Oakland, on the 17th; at Seaford, Del., on the 17th; at Woodstock, on the 28th.

Sleet.—At Boettcherville, on the 6th, 11th; at Denton, on the 6th, 17th; at Edgemont, on the 28th; at Fenby, on the 28th; at Frederick, on the 6th; at Glyndon, on the 6th, 13th, 21st, 28th; at Kirkwood, Del., on the 9th, 28th; at Millsboro, Del., on the 11th, 17th; at Mt. St. Mary's, on the 22nd; at New Market, on the 5th, 13th, 28th; at Oakland, on the 16th; at Penn's Grove, N. J., on the 6th; at Seaford, Del., on the 5th; at Solomon's, on the 17th, 22nd; at Westminster, on the 6th, 13th, 28th; at Woodstock, on the 28th.

Halos.—Lunar, at Barron Creek Springs, on the 5th, 23rd. Solar, at Barron Creek Springs, on the 5th, 23rd.

Auroras.—At Baltimore, on the 4th; at Barron Creek Springs, on the 4th; at Darlington, on the 4th, 15th, 19th; at Glyndon, on the 4th, 15th; at Millsboro, Del., on the 4th; at New Market, on the 4th; at Penn's Grove, N. J., on the 4th; at Solomon's, on the 5th; at Sunny Side, on the 4th.

Average number of clear days, 8; fair days, 10; cloudy days, 10; rainy days (.01 of an inch or more), .11.

CROPS.

Oakland, Garrett Co.—The snow that fell dur-

ing the past month was very much drifted, and gave slight protection to crops.

Jas. D. Hamill.

Sunny Side, Garrett Co.—The ground was uncovered from the 2nd to the 12th; since, it has been covered with ice from 1 to 3 inches thick. The snow that fell blew off and drifted from 3 to 15 feet deep. All crops suffered to some extent during the first part of the month.

John G. Knauer.

Westminster, Carroll Co.—The fields are about two-thirds covered with patches of snow, varying from 1 inch to 1 foot in depth. Crops in the ground have been quite well protected since the 17th, and have not yet shown any injury from the severe winter weather.

John T. Cassell.

Solomon's, Calvert Co.—The month of February was rather unfavorable for crops. Wheat is looking bad.

Wm. H. Marsh.

Cambridge, Dorchester Co.—The weather during the past month has been remarkably good, although it was not beneficial to wheat, the frequent freezing and thawing (as the crop was protected by snow) slightly injured it. The peach-buds have not been killed where they grow near the salt water, but those that grow inland have been killed, in many sections. It is thought that there will be a fair crop in this county, if the weather continues favorable so that they will not bloom too early.

Calvert Orem.

Millsboro, Sussex Co., Del.—The ground was well covered from January 10th to 28th, but there having been cold weather before the 10th, crops were not aided by the blanket of snow. Peach-buds prove lifeless for the most part. Maple trees were burst by the severity of the cold. A few snow banks could be found at the end of the month, in the shade of the pine woods.

Lewis W. Wells.

NOTES BY OBSERVERS.

Baltimore.—19th, wind storm from the N. W., 9.45 P. M., accompanied by rain, snow, thunder and lightning. The temperature fell 15° in ten minutes.

Cumberland (H. Shriver).—3rd, fine display of zodiacal lights. 6th, Potomac river, above town, filled with broken ice cakes, varying in thickness from 8 to 12 inches. 10th, ice left the creek to-day. 19th, severe wind storm from the N. W., accompanied by rain, which in a few seconds turned to snow. After the passage of the hurricane proper, which lasted less than twenty seconds, perhaps not more than ten, the wind continued at intervals to blow furiously with a roaring sound, but altogether inferior in violence to the main blast, which I estimated at 45 to 55 miles per hour. The temperature was 39° during the day, and fell to 7° above zero during Sunday night. 28th, snow still lying on the hillsides; stream flush from melting snow.

Edgemont.—19th, 8.30 P. M., severe snow-storm with high wind, thunder and lightning.

Fallston.—On the evening of the 19th a wind storm from the N. W. struck this place with great and sudden violence. Dwellings were endangered, and in some instances unroofed. No rain accompanied the storm, but a form of hail, like snow. The mean temperature during February, at this point, for the past twenty-two years, 32.6.

Fenby.—On the 19th a light rain at dark, turning to snow; heavy wind storm began during the evening and increased to a hurricane at 9.30 P. M. A flash of lightning was observed for ten minutes, and the drifting snow prevented travelers from seeing their way. Much damage was done to property of all kinds.

Oakland.—Mean temperature at 9 P. M.,

16.3°; highest, 50°, on the 1st and 2nd; lowest, —13°, on the 20th. Total snowfall, 13 inches.

Penn's Grove, N. J.—Mean temperature for the first eleven days, 33.6°; mean maximum, 39.9°; mean minimum, 27.0°; highest, 46°, on the 11th; lowest, 14°, on the 5th.

Westminster.—17th, heaviest snow-storm of the season. 19th, a sudden and very violent wind storm, 9 P. M., and the greatest ever known in this section. 22nd, very stormy, and the snow of the previous night badly drifted, causing the roads to be blocked worse than at any time known since January, 1857. Roads running north and south are still blocked with snow and are not open to travel, the drifts being too large to be removed by shoveling. Temporary roads are being used through the fields.

Meteorological Stations reporting to the Maryland State Weather Service.

Stations of Observation.	County.	Observer.
Baltimore.....	.....	G. N. Wilson, A. T. Brewer, H. D. Stuart.
Barron Creek Springs.....	Wicomico.....	Albert E. Acworth.
Boettcherville.....	Alleghany.....	F. F. Brown.
Cambridge.....	Dorchester.....	Calvert Orem.
Cumberland (a).....	Alleghany.....	Howard Shriver.
Cumberland (b).....	Alleghany.....	E. T. Shriver.
Darlington.....	Harford.....	A. F. Galbreath.
Denton.....	Caroline.....	F. C. Ramsdell.
Distributing Reservoir, D. C.....	.....	Lieut.-Col. Elliot.
Dover, Del.....	Kent.....	Jno. S. Jester.
Easton.....	Talbot.....	G. W. Minnick.
Edgemont.....	Washington.....	Chas. Feldman.
Fallston.....	Harford.....	G. G. Curtiss.
Fenby.....	Carroll.....	Wm. Fenby.
Frederick.....	Frederick.....	G. Ernest Bantz.
Glyndon.....	Baltimore.....	A. W. Nyce.
Great Falls.....	Montgomery.....	Lieut.-Col. Elliot.
Jewell.....	Anne Arundel.....	Jos. Plummer.
Kirkwood, Del.....	New Castle.....	W. C. L. Carnagey.
Leonardtown.....	St. Mary's.....	G. W. Joy.
McDonogh.....	Baltimore.....	W. W. Walker.
Millsboro, Del.....	Sussex.....	Rev. L. W. Wells.
Mt. St. Mary's (Emmitsburg).....	Frederick.....	J. A. Mitchell, A. M.
New Market.....	Frederick.....	H. H. Hopkins, M. D.
Penn's Grove, N. J.....	Salem.....	Wm. T. Wilson.
Receiving Reservoir, D. C.....	.....	Lieut.-Col. Elliot.
Salisbury.....	Wicomico.....	Col. Lemuel Malone.
Seaford, Del.....	Sussex.....	H. L. Wallace.
Solomon's.....	Calvert.....	W. H. Marsh, M. D.
Sunny Side.....	Garrett.....	Jno. G. Knauer.
Taneytown.....	Carroll.....	C. W. Weaver, M. D.
Washington, D. C.....	.....	S. W. Beall.
Woodstock College.....	Howard.....	T. J. A. Freeman, S. J.
Norfolk, Va.....	.....	A. B. Crane.

Stations Displaying Weather Signals.

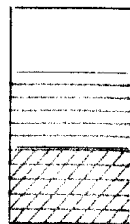
Stations.	County.	Displaymen.
Annapolis.....	Anne Arundel.....	W. M. Abbott.
Appleton.....	Cecil.....	W. C. Henderson.
Barron Creek Springs.....	Wicomico.....	L. A. Wilson.
Bel Air.....	Harford.....	N. N. Nock.
Bradshaw.....	Baltimore.....	B. F. Taylor.
Bridgeville, Del.....	Sussex.....	T. J. Gray.
Buckeystown.....	Frederick.....	A. W. Nicodemus.
Cambridge.....	Dorchester.....	Calvert Orem.
Chestertown.....	Kent.....	J. S. Vandegrift.
Darlington.....	Harford.....	A. F. Galbreath.
Delaware City, Del.....	New Castle.....	W. E. Reybold.
Dickerson.....	Montgomery.....	W. H. Dickerson.
Easton.....	Talbot.....	G. W. Minnick.
Emmitsburg.....	Frederick.....	J. A. Mitchell, A. M.
Frederick.....	Frederick.....	W. T. Delaplaine.
Frostburg.....	Alleghany.....	C. J. Conner.
Grantsville.....	Garrett.....	T. H. Bittinger.
Greensboro.....	Caroline.....	Plummer & Plummer
Havre de Grace.....	Harford.....	W. S. McCombs.
Hyattsville.....	Prince George's.....	E. B. Rowell.
Laonacoring.....	Alleghany.....	J. J. Robinson.
Middletown.....	Frederick.....	G. C. Rhoderick, Jr.
Milford, Del.....	Kent.....	J. Y. Foulk.
Odenton.....	Anne Arundel.....	E. B. Watts.
Ridgely.....	Caroline.....	J. A. Sigler.
Salisbury.....	Wicomico.....	L. W. Gunby.
Seaford, Del.....	Sussex.....	Dr. Hugh Martin.
Snow Hill.....	Worcester.....	Purnell & Vincent.
* Sparrow's Point.....	Baltimore.....	Md. Steel Co.
St. Michael's.....	Talbot.....	E. M. Jefferson.
Westminster.....	Carroll.....	W. S. Myer & Bro.
Wilmington, Del.....	New Castle.....	Wm. Lawton.

*Whistle Signals only.

MAP OF
MARYLAND AND DELAWARE

SHOWING
THE PRECIPITATION
AND
LINES OF MEAN TEMPERATURES
FOR FEBRUARY, 1893.

Scale of Shades:



0 TO 2 INCHES.

2 TO 4 "

OVER 4 "

SCALE OF MILES.



THE FRIEDENWALD ED. WITH SHADES

J. H. CORBETT

MONTHLY SUMMARY OF REPORTS, FEBRUARY, 1893.

STATIONS.	COUNTIES.	Altitude above sea in ft.	Latitude.	Longitude.	TEMPERATURE.												Monthly Range.	Total Precipitation.	Clear Days.	Fair Days.	Cloudy Days.	Rainy Days.	Prevailing Wind.
					Monthly Mean.	Mean of Max.	Mean of Min.	Max.		Min.													
								Degrees.	Date.	Degrees.	Date.												
Baltimore.....		178	39°17'	76°36'	34.0	40.9	27.2	61	15	11	20	50	4.43										
Barron Ck. Springs.....	Wicomico.....	25	38 30	75 39	35.2	42.8	27.6	63	15	12	21	51	4.39										
Boettcherville.....	Alleghany.....		39 39	78 48	31.6			58	15	5	21	63	4.40										
Cambridge.....	Dorchester.....		39 33	76 6	38.9	47.9	30.0	69	15	16	20	53	4.80	12	1	15	7						
Cumberland.....	Alleghany.....	700	39 39	78 46	32.8	40.2	25.3	57	15	2	22	55	3.96						N.W.				
Cumberland.....	Alleghany.....	700	39 39	78 46	31.8	38.1	25.5	58	15	3	21	55	3.58	8	11	9	8						
Darlington.....	Harford.....	300	39 39	76 14	31.0	39.6	22.5	58	16	2	28	56	4.74	10	8	8	9	N.W.					
* Denton.....	Caroline.....	42	38 47	75 41	36.0			70	15	12	21	58	4.38										
Dist. Res., D. C.....			38 52	77 0	35.0			61	15	13	20	48	3.53										
Dover, Del.....	Kent.....		39 9	75 31	34.9	43.0	26.8	64	15	11	21	53	5.05	9	8	14	15	N.W.					
Esaton.....	Talbot.....	35	38 42	76 6	34.6	42.4	28.8	63	15	11	5	52	3.87	9	11	8	7	N.W.					
Edgemont.....	Washington.....		39 45	77 29	31.5	39.0	24.0	59	15	3	4	20	55										
Fallston.....	Harford.....		39 31	76 24	31.3			59	15	6	21	53	5.43	6	13	9	9	N.W.					
Fenby.....	Carroll.....	950	39 33	77 5	29.6			56	15	4	21	52	4.24	5	12	11	7	N.W.					
Frederick.....	Frederick.....	280	39 24	77 18	32.6	39.2	26.1	58	15	10	20	48	4.06	12	11	5	12						
Glyndon.....	Baltimore.....	660	39 27	76 41	30.8			57	15	7	20	50	4.51	8	11	9	15	N.W.					
Great Falls.....	Montgomery.....		39 9	77 14	34.4			60	15	9	21	51	2.76										
Jewell.....	Anne Arundel.....		38 44	76 36	36.2								2.22	8	9	11	6	N.W.					
Kirkwood, Del.....	New Castle.....		39 35	75 40	28.2			58	16	8	21	50											
Leonardtown.....	St. Mary's.....		38 18	76 40	36.8	43.7	29.9	66	15	15	20	51	4.60	9	11	8	8	N.E.					
McDonogh.....	Baltimore.....	535	39 23	76 44	33.2	41.9	24.5	58	15	5	21	53	4.14										
Millsboro, Del.....	Sussex.....		38 35	75 15	36.8	46.8	26.9	66	15	12	21	54	4.43	13	7	8	11	N.					
Mt. St. Mary's.....	Frederick.....	730	39 41	77 21	31.1	38.9	23.3	61	15	5	21	56	4.70	5	13	10	10	N.W.					
New Market.....	Frederick.....	500	39 23	76 27	31.2			58	15	6	21	52	4.01	7	11	10	12	N.W.					
Rec. Res., D. C.....			38 52	77 0	34.6			60	15	12	21	48	3.67										
Salisbury.....	Wicomico.....		38 26	75 35	36.4			60	1	17	20	43		17	1	10		N.W.					
Seaford, Del.....	Sussex.....		38 40	75 35	36.8	47.2	26.4	66	15	13	20	53	4.85										
Solomon's.....	Calvert.....	20	38 19	76 27	36.4	43.8	29.1	65	15	16	20	49	4.65	4	3	21	14	N.W.					
Sunny Side.....	Garrett.....		39 22	76 26	24.4							4.94	5	13	10	16	S.W.						
Taneytown.....	Calvert.....		39 40	77 9								2.60											
Washington, D. C.....		112	38 52	77 0	35.2	42.9	27.4	65	15	11	21	55	4.25	9	7	12	13	N.W.					
Westminster.....	Carroll.....		39 35	77 3	30.1			57	15	6	21	51	4.80	6	13	9	8	N.W.					
Woodstock.....	Howard.....	392	39 20	76 49	33.2			58	15	4	21	54	5.45	5	12	11	18	N.W.					
† Norfolk, Va.....		34	36 51	76 17	41.9	49.6	34.2	70	16	23	20	47	4.04	10	7	11	11	N.E.					
Averages.....					33.3	42.3	26.4					52.4	4.23	8.3	9.5	10.3	11.0	N.W.					

*5th and 26th missing. †Omitted in computing averages.

DAILY PRECIPITATION FOR FEBRUARY, 1893.

STATIONS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
Baltimore.....	.03	T	.02			.44	.03		T	.56	.28		1.21			.02	.78	.09	T	T	.01	.21			.08			.72				4.43
Barron Ck. Spr.						.63			1.21	T	1.42						T	.33			T	.26			.01			.53				4.39
Boettcherville.....			.40			.20	.10		.80		1.00						T	1.40			T	.50						T				4.40
Cambridge.....	T				T	.05			T	.36	.02	1.80	1.01				.64											.92				4.80
Cumberland.....			.40			.19			.75				.70				1.00				.40							.52				3.96
Cumberland.....	.26	.06					.23		.61		.80	.04	1.00				.80				.50				T			.42				3.58
Darlington.....						.52				.80	.04	1.00					.95		.04		.44							.95				4.74
Denton.....						.44			.14			.67	1.80				.20	.10										.63				4.38
Dist. Res., D. C.....						.22	.06			.32	.40		.80	.65				.75				.33										3.53
Dover, Del.....	.04		.01				.31				.72		1.85		.04			.81				.34						.98				5.05
Esaton.....	.02					.39	T				.85		1.88					.55		T	T							.18				3.87
Fallston.....	.05					.50				.89	.21		1.33	.02			.88				.45							1.10				5.43
Fenby.....						.50	.40		T	.50			.90				.59					.45						.90				4.24
Frederick.....	.04		.05			.39				.31	.13		1.00				.86		T		.40							.88				4.06
Glyndon.....	.02	T	T		.05	.49			.02	.60	.19	.25	.67				.88	.14	.04		.16	.23			.03			.74				4.51
Great Falls.....						.23	.06			.34	.26		.66	.23				.78				.20										2.76
Jewell.....	T		T		T		.20		T		.50		.60	T	T		.20					.10						.62				2.22
Leonardtown.....						.96				1.24		1.02	T	T			.49				.16							.73				4.60
McDonogh.....	.08		.06			.38				.53	.22		1.16				.30	.04			.06	.24			.05			1.02				4.14
Millsboro, Del.....			.02			.43			.01	.42	.70	T	1.01				.80	.10			.13	.35						.86				4.43
Mt. St. Mary's.....	.12	.05	.01				.75			.83			.79				.75											1.20				4.70
New Market.....						T				T			2.00				.80					.65						.36				4.01
Rec. Res., D. C.....						.13	.16			.45	.38	.08	.78	.87		.04		.73							T		.55					3.67
Seaford, Del.....	.03					.52				.12	.96		1.61				.71					.35										4.65
Solomon's.....	T			.10	.26	.02		.01	.32	.69	.02	1.65		T	T		.11	.50	T		.02	.16			T	.01		.78				4.65
Sunny Side.....	.01	.01	.30			.50	.50		.20	T		.12		.30			.80	.60	.20			.20	.30	T	.10			.40				4.84
Taneytown.....						.59			.17	.62			.60		.05	.01					.22							.34				2.60
Wash., D. C.....	.01		.01			.30			.01	.36	.41	T	1.48		.03		.66	.07		T	.01	.32			T			.58				4.25
Westminster.....	.05					.30			.50	.56			.90				.65										.80					4.30
Woodstock.....			T			.45	.05			.60		.40	1.10	T			.40			.20	.54				T							5.45
Norfolk, Va.....						.12	.07		T	.11	1.30	.07	.45		.01	T	1.50	T			.10	.05				T		.26				4.04

NOTE.—"T" indicates a trace of rain or snow.

A. T. B.