The Geological Survey is making a geologic map of the United States, which necessitates the preparation of a topographic base map. The two are being issued together in the form of an atlas, the parts of which are called folios. Each folio consists of a topographic base map and geologic maps of a small area of country, together with explanatory and descriptive texts.

THE TOPOGRAPHIC MAP.

The features represented on the topographic map are three distinct kinds: (1) inequalities of surface, called relief; as plains, plateaus, valleys, hills, and mountains; (2) distribution of water, called drainage, as streams, lakes, and swamps; (3) the works of man, called culture, as roads, railroads, boundaries, villages, and cities.

Relief.—All elevations are measured from mean sea-level. The heights of many points are accurately determined, and those which are most important are given on the map in figures. It is desirable, however, to give the elevation of all parts of the area mapped, to delineate the horizontal outlines, or contour, of all slopes, and to indicate their grade or degree of steepness. This is done by lines connecting points of equal elevation above mean sea-level, the lines being drawn at regular vertical intervals. These lines are called contours, and the uniform vertical space between two such contours is called the contour interval.

Fig. 1.—Ideal sketch and corresponding contour map.

The manner in which contours express elevation, form, and grade is shown in the following sketch and corresponding contour map:

1. A contour indicates approximately a certain height above sea-level. In this illustration the contour interval is 50 feet; therefore the contours are drawn at 50, 100, 150, 200 feet, and so on, above sea-level. Along the contour at 250 feet lie all points of the surface 250 feet above sea; and similarly with any other contour. In the space between any two contours are found elevations above the lower and below the higher contour. Thus the higher hill is stated to be 670 feet above sea-level by the contour of 670 feet, but this is only an approximation, as the contour at 650 feet lies so near it that it might be more than 650 but less than 670 feet above sea.

2. Contours define the forms of slopes. Since contours are continuous horizontal lines conforming to the surface of the ground, they wind around smoothly about the re-entrant angles of ravines, and project in ease of prominence. The relations of contour curves and angles to forms of the landscape can be traced in the map and sketch.

3. Contours show the approximate grade of any slope. The vertical guide to the traveler; serves the investor or owner who desires to ascertain the position and surroundings of property to be purchased, the engineer planning surveys in locating roads, railways, and irrigation ditches; provides educational material for schools and homes; and many of the purposes of a map for local reference.

The GEOFLOGIC MAP.

The maps representing areal geology show by colors and conventional signs, on the topographic map, the distribution of rock formations on the surface of the earth, and the structure section maps show their underground relations, as far as known, and in as much as the scale permits.

KINDS OF ROCKS.

Rocks are of many kinds. The original crust of the earth was probably composed of igneous rocks, and all other rocks have been derived from these. The igneous rocks, being non-sedi-mentary, are formed in situ. Atmospheric agencies gradually break up igneous rocks, forming superficial, or surficial, deposits in beds and trains. These products of the ocean are changed: areas of deposition may rise above the water and become land areas, and areas of erosion may sink below the water and become areas of deposition. If North America were gradually to sink a thousand feet the sea would flood the present Mississippi Valley and the Mississippi and Ohio valleys from the Gulf of Mexico to the Great Lakes; the Appalachian Mountains would become islands in the ocean, and the coast of the ocean's shore would traverse Wisconsin, Iowa, and Kansas, and extend thence to Texas. More extensive changes have occurred, and may be anticipated in the past.

The character of the original sediments may be changed by chemical and dynamic action so as to produce metamorphic rocks. In the metamorphosis of a sedimentary rock, just as in the metabolism of a living organism, the substances of which it is composed enter into new combinations, or new substances may be added. When these processes are complete the sedimentary rock is changed into a new kind of rock, called a "metamorphic rock." This change may be brought about either by the action of air, water, frost, and living organisms, or by the agency of fire. Metamorphism, or the change of one kind of rock into another, may result from the action of heat or from increased pressure or both. When these agents act upon the rocks they undergo a series of changes that are known as metamorphism, and the changes that are due to heat are known as igneous metamorphism. The character of the new rock is determined by the nature of the original rock, the kind of heat action, and the conditions of temperature and pressure.

Igneous rocks are formed in large bodies, called "sills" or "laccoliths." Such changes may be produced by the action of air, water, frost, and living organisms, or by the agency of fire. Metamorphism, or the change of one kind of rock into another, may result from the action of heat or from increased pressure or both. When these agents act upon the rocks they undergo a series of changes that are known as metamorphism, and the changes that are due to heat are known as igneous metamorphism. The character of the new rock is determined by the nature of the original rock, the kind of heat action, and the conditions of temperature and pressure.
forming another gradation into sedimentary deposits. Some of this glacial wash was deposited in tunnels and channels in the ice, and forms characteristic ridges and hollows, which lie in a horizontal plane.

The material deposited by the ice is called glacial drift; that washed away by surface water is known as sandy drift, or sand and gravel, and kames. The material deposited by the ice is called glacial drift; that washed away by surface water is known as sandy drift, or sand and gravel, and kames.

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