PHYSIOGRAPHIC GEOLOGY.

Physiographic geology is one of the divisions of the general science of geology. The following is condensed from Professor Dana's new and incomparable "Manual of Geology :"—

Physiographic geology embraces a general survey of the earth's surface features. The earth is a sphere flattened at the poles, and from this it is inferred that it was at one period in a soft condition, as the flattening at the poles is just equal in amount to that which would be produced in revolving a liquid globe of the same size and density as the earth. On the surface of the globe the proportion of water to dry land is as 8 to 3, and the proportion of land north of the equator is three times as great as that at the south. The zone containing the largest proportion of land is the north-temperate. In the northern hemisphere the land covers 38,900,000 square miles; in the southern 13,600,000 square miles. Out of the 197,000,000 square miles which make up the entire surface of the globe, 144,500,000 are water. The oceanic depression is a vast sunken area varying in depth from a few feet to about 50,000 feet. The border of the ocean on the North American coast, off New Jersey, extends out for 8 miles and is shallow, not exceeding 600 feet deep; then it dips down at a steep angle to a great depth. The average breadth of the Atlantic ocean is 2,800 miles; that of the Pacific 6,000 miles; and the mean hight of the entire continent of America above the level of the sea is 930 feet; South America is higher than North America. There are three ranges of American mountains, namely, the Appalachians, Andes and Rocky Mountains. The latter is not a narrow barrier between the East and the West, as it appears on the maps, but a vast gentle swell of the surface having a base 1,000 miles in breadth, the slopes being diversified with mountain ridges and plateaus. On the eastern side they rise at the rate of only ten feet to the mile, continuing for 600 miles; on the west they slope for 400 miles; their passes have a hight of from 6,000 to 10,000 feet, while ridges rise above them to an elevation of 14,000 feet. In the Andes the eastern slope rises about 60 feet in the mile; the western about 150 feet, and their passes are at hights varying from 12,000 to 16,000 feet, the highest peak—Sorata in Bolivia—is 25,290 feet. In the Appalachians—which includes all the mountains from Georgia to the Gulf of St. Lawrence—the mountain mass is much smaller. In North Carolina their highest peaks are from 6,000 to 6,800 feet. There are several elevated plateaus on the American continent, such as the great Mexican plateau in which the city of Mexico lies, which is about 7,482 feet in hight; and the city of Potosi is situated on a plateau at 13,330 feet elevation. Plateaus and mountains are the sources of rivers, of which there are several great river systems on this continent. The interior of the United States belongs to one river system—that of the Mississippi. Its tributary streams rise on the west among the snows of the Rocky Mountains; those on the north in the central plateau west of Lake Superior; and those on the east in the Appalachians from Western New York to Alabama. The St. Lawrence is another river system, commencing in the head waters of Lake Superior, and it embraces the great lakes, with their tributaries and the rivers of Canada flowing eastward to the Atlantic ocean. Mackenzie river is the central trunk of another system—the northern; and the Saskatchewan is a minor system flowing into Hudson's Bay.

Continents in general have elevated mountain-borders and a low or basin-like interior, and the higher border faces the larger ocean. On the side of the Pacific ocean are the high Rocky Mountains, on the Atlantic side are the comparatively low Appalachians, while between the two is the great interior plain. On the north is the small Arctic ocean, which has no distinct mountain chain facing it. In the mountain ranges of eastern North America there are curves like those of eastern Asia. The Green Mountains run nearly north and south, but the continuation of this line of hights across New Jersey into Pennsylvania curves around gradually to the westward, and the Alleghanies in their course from Pennsylvania to Alabama and Tennessee have the same curve. An outer curving range also borders on the ocean extending from Newfoundland along Nova Scotia, then it becomes submerged and forms the sea-bottom of south-eastern New England and Long Island. Between this range and the Green Mountains lies one of the great basins of ancient geological times, while to the westward of the Green Mountains and the Alleghanies was the grand interior basin of the continent. These two basins were to a great extent distinct in their geological history and apparently independent in their coal deposits and some other formations.

The fertility of a country depends upon its rains. In South America the annual fall of rain is 116 inches; in the temperate zone of the United States it is 44 inches; in Europe only 32 inches. America has been styled by Professor Guyot the "forest continent." The waters of the Gulf of Mexico are a provision against excessive drought to the adjoining continent. Warm, moist breezes from the Gulf flow northward and are condensed into rains in the valley of the Mississippi, which is thus provided with the elements of perpetual fertility. This part of the American continent has already become the granary of England as well as of the United States.

VALUABLE RECEIPTS.

Copal Varnish.—Many difficulties seem to attend the manufacture of this varnish, and lately we have received several communications requesting information on the subject. The following extract is taken from an article published in *Dingler's Polytechnic Journal*, a German publication, and written by Professor Heeren. He says :—"There is no difficulty in dissolving copal in fatty and volatile oils when the resin has been previously fused; by this process, however, a more or less distinct coloration is produced, and the natural hardness of this fine resin is injured. It has therefore been often attempted to dissolve copal without previous fusion; but, as is well known to all who have occupied themselves with this question, great difficulties have been found in effecting the solution. Directions have been given to soak the pounded copal in ether or ammonia until it swells up into a gelatinous form, and then to dissolve it in strong alcohol; but this process never succeeded, though it was tried repeatedly. Others recommend hanging the copal in a small bag in a retort, in which absolute alcohol is gently boiling. This method also failed in producing even a tolerably-concentrated varnish." The best prescription appears to the author to be that given by Freudenvoll in his treatise on the preparation of varnishes. According to him, 4 ounces of West Indian copal are dissolved in a mixture of 4 ounces of oil of turpentine and 6 ounces of alcohol of specific gravity 0.813: or a mixture of 4 ounces of sulphuric ether, 4 ounces of oil of turpentine, and 4 ounces of alcohol of specific gravity 0.851. When engaged in testing this process, which gave very good results, the author found a small variation, which he describes as follows, particularly efficacious :—"Two sorts of copal occur in commerce, the East and West Indian. The former is usually in small, irregular, rounded pieces, with a finely-verrucose surface, the resemblance of which to the skin of a goose has obtained for it the name of goose copal. It is of a somewhat yellow color, and is preferred for the manufacture of oily copal varnish, because it acquires less color by fusion than the West Indian. The latter does not possess a warty surface; it is very pale in color, often nearly colorless, and occurs in large irregular fragments, partly with a rounded surface and partly with a shelly fracture."

"West Indian copal only can be employed in the following solution, the East Indian forming only gelatinous lumps, but never a solution. The solvent is a mixture of 60 parts by weight of alcohol of specific gravity 0.813, 10 parts by weight of sulphuric ether, 40 parts by weight of oil of turpentine, in which 60 parts of copal are to be dissolved for the production of a varnish of an oleaginous consistence. Solution takes place, even in the cold, without any previous gelatinous swelling of the copal; but it is effected much more rapidly with the assistance of a gentle heat. As, however, single pieces are often found in the West Indian copal, which instead of dissolving only swell up in the fluid, by which the rest of the solution is spoiled, it is advisable to select only the large and perfectly clear pieces for the purpose of varnish-making, and to test each first of all as to its solubility. This little trouble is richly repaid by the certainty of the result. To test this quality, a small splinter of the copal is put into a small test-tube; a little of the solvent fluid is then poured in, and the whole is heated. If the copal dissolves completely in a few minutes without becoming gelatinous, it is good. When the desired quantity of good copal has been got together in this manner, it is to be pounded to a tolerably fine powder, which is to be put into a glass retort or flask, the necessary quantity of the solvent added, and the whole heated and shaken until solution is effected. To clear the varnish, which may appear somewhat dull, from dust or other impurities, it may be allowed to stand a long while until these settle; or if it be desired to effect this quickly, it may be filtered through blotting-paper, placed as a filter in a glass funnel; the filter must not project above the edge of the funnel, so that the latter may be closed by a glass plate laid over it. The passage of the thick varnish is of course very slow, but the varnish is obtained perfectly clear in this manner; and if the copal employed was very clear, it is nearly colorless. It dries rapidly, but like all turpentine varnishes, it retains a slightly sticky surface for some days."

Fire Gilding for Watch Movements.—All the brass work of watches are gilt, otherwise they would soon tarnish and become useless. The following is one mode of fire gilding such articles. First, dissolve gold in aqua-regia (a mixture of acquafortis and muriatic acids), then precipitate the gold by adding copperas to the solution. The gold powder which falls to the bottom of the vessel is then washed with water and dried, and amalgamated with mercury so as to make a paste. The plates and wheels of the watches are well cleaned, and dipped in dilute nitrate of mercury, until they assume a whitish appearance, when the amalgam of gold and mercury is spread over them in a thin coat, then they are heated over a clear charcoal fire. When it is observed that the mercury is passing off by evaporation, take and brush them softly, then heat them again and brush as before until the mercury disappears entirely. After this they are finished with a fine scratch brush. If some very fine filings of silver are mixed with the amalgam, they will leave little projections on the surface of the articles, and give them the appearance of frosted work, so much admired by watch-makers.

Muriate of Zinc in Soldering.—A correspondent sends us the following as his method of using the muriate of zinc in soldering :—"The muriate of zinc is made by dissolving zinc in commercial muriatic acid, permitting the acid to take up the full equivalent of the metal. It is used as a flux in soldering metals, and in applying it, copper and brass that are not very dirty need no scouring at all, but can be soldered as easily as tin plate with resin. The same may be said of gold, silver, lead, and any other metal, except iron, which must be brightened first; also zinc, for which use pure muriatic acid only. For soldering new tin plate, about an equal quantity of water may be added without impairing its efficiency; wipe off with a damp cloth, and you have a stronger and neater seam than can be made with resin."

An American Custom.—A Bordeaux paper says:—"On the Fourth of July (inaugurated by Lafayette) there exists a curious custom in America. As the clock strikes twelve, every man and boy, and as many women and girls as can, set to work to whistle 'Yankee Doodle,' and which continues for precisely ten minutes. It may be fairly computed there are thirty millions of people sibilating simultaneously. The effect is very curious."

[Precisely. So also is the "fact" that the Fourth of July was inaugurated by Lafayette.—Eds.]

Woolen goods are taking the place of cotton fabrics to a large extent, for many articles of clothing, among the working classes of Europe, just as they have lately done among ourselves. Flannel outer shirts are now worn by thousands of persons who would have scorned to wear such articles two years ago.