These conditions, brought about by action during the glacial period, are among those which, in Dr. Dawson's opinion, have most tended heretofore to retard the development of metalliferous mining in British Columbia. Other circumstances which have operated in the same direction are, the densely wooded character of a great part of the country; the fact that the rivers are suited for navigation only in detached reaches; the remoteness from the coast of the richest and best-known placer-mining districts; and the cost of labor, supplies, and machinery, which may be regarded as in part concomitants, in part direct results, of these. Owing to the inaccessibility of the country, it has, till very recently, been prospected and exploited by the placer-miner alone, who has been deterred by no difficulty from reaching the most remote spots in which rumor, or reasoning of his own, lead him to expect the existence of the precious metal. Little knowledge or effort was expended in the search for metalliferous veins. Many such deposits supposed to be of value, were, it is true, located, and time and money which could ill be spared often uselessly spent upon them, leading only to discouragement. Even where the indications met with were altogether favorable, the original discoverer generally found that the capital and knowledge required for their development were not at his command, and it was difficult to interest those capable of dealing with such mines in a region which they could not easily visit and become familiar with at first-hand. With regard at least to the whole southern portion of the province, however, all this is now happily changed.

While speaking of causes which have hitherto stood in the way of vein-mining, it must also be mentioned that not the least important of these has been, and still is, the fictitious or exaggerated value too frequently placed upon entirely undeveloped discoveries. While it is manifestly right that the discoverer should be properly remunerated, it should be remembered that a mere surface showing, however promising, generally requires the expenditure of a large sum before its true value can even be ascertained, and that till thus developed it is unreasonable to expect a large payment for any mining claim.

In preceding paragraphs particular attention has been drawn to certain notable differences between the better-known and more fully developed regions of the southern part of the Pacific slope and those of the province of British Columbia, chiefly as a note of caution against the rash assumption of complete uniformity in conditions too often made without due investigation. The salient fact of the general identity of the structural features of the Cordillera region south and north, however, remain, and is such, that from this alone, even without taking into consideration the numerous and important discoveries already made, we should be justified in predicting an eventual great development of metalliferous mining in the province. It has already been stated that British Columbia includes a length of over 800 miles of the most important metalliferous belt of the continent; and, adding to this the northern extension of the same belt beyond the 60th parallel, we find that within the boundaries of Canada its entire length is between 1,200 and 1,300 miles. This, as has elsewhere been noted, is almost precisely equal to the whole length of the same region included by the United States from the southern line of Canada to the northern boundary of Mexico; and Dr. Dawson, after having enjoyed exceptional opportunities of investigation, feels no hesitation in recording his belief that the northern moiety of the Cordillera will ultimately prove to be susceptible of a development corresponding in importance to that which has already been attained in the southern.

British Columbia first rose from the position of a fur country to the rank of a colony, on the discovery of gold upon the Lower Fraser in 1858. Its subsequent history for a number of years is substantially that of the sudden rise and subsequent slow decline in importance of placer gold-mining. Coal-mining has, however, concurrently advanced, slowly but steadily, till it has obtained its present pre-eminent position. Such historical facts as appear to be important to the appreciation of these industries are touched on later in connection with them. With respect to vein-mining proper, we have as yet to chronicle merely the first steps; but in the southern part of the province the completion of the Canadian Pacific Railway has at length afforded the necessary impetus in this direction, and it is very gratifying to find, as an immediate consequence, that this part of the country is rapidly beginning to prove its valuable character, and to justify the confidence which those best able to form an opinion on the subject have always felt and frequently expressed. Every thing which has been ascertained of the geological character of the province as a whole, tends to the belief, that, so soon as similar means of travel and transport shall be extended to what are still more inaccessible districts, these also will be discovered to be equally rich in minerals, particularly in the precious metals, gold and silver. In the southern district, for which information is most complete, praiseworthy efforts are now in progress, at a number of widely separated localities, toward the exploitation of ores, which, in many cases, have already been proved to be of an exceptionally valuable character. Here, at least, there is every reason to believe that we are on the point of witnessing the inauguration of an era of mining activity of the most important kind.

AMONG THE PUBLISHERS.

THE *Journal of Morphology* for June, being the first number of Vol. III. (Boston, Ginn), contains the following articles, besides eight lithographic plates: "The Actiniaria of the Bahamas," by Playfair McMurrich; "Contributions to the Osteology of the North American Passeres," "Notes on the Anatomy of Speotyto," by R. W. Shufeldt; "Variation of the Spinal Nerves in the Caudal Region of the Domestic Pigeon," by James I. Peck. The second number, that for August, will contain "The Mechanical Origin of the Structures of the Hard Parts of the Mammalia," by E. D. Cope; "The Embryology of Blatta and Doryphora," by William M. Wheeler; besides numerous cuts and seven lithographic plates. For the third number, the "Embryology of Linnbricus," by E. B. Wilson, is promised, and a paper by William Patten, dealing with the general embryology, including the segmental sense-organs, of arthropods. This number will probably be issued in October. A fourth number will probably be given with this volume, but its contents cannot be definitely stated. The subscription price is nine dollars for the volume, whether including three numbers or four.

— We have just received the first part of Vol. I. of the new "Century Dictionary," published by The Century Company, New York. This number appears in a unique and attractive binding, embracing the letters from A to Appet, and will be a welcome addition to the library. The work will be completed in six volumes of four parts each.

LETTERS TO THE EDITOR.

Fog.

A GREAT deal of discussion has recently taken place on the properties of fog and its causes. One writer attributes the celebrated London fog to the cooling of the air by radiation from hillsides near the city, which air, flowing down, envelops the city. It has also been suggested that a cool northerly wind on the west side of a storm flows into the saturated air on the south side, and condenses fog. Again, over Newfoundland it is thought that a saturated current flows from the southward to cooler waters, often having ice floating in them, and thus produces fog. The objection to the first theory is, that the cause assigned could not develop a fog 500 or 1,000 feet thick. In the second case it seems plain that the cool north wind is always dry, and would quickly render the air unsaturated. In the last case, while the cause assigned might produce a fog just at sea-level, yet this would hardly be extensive enough, and it is probable that a calm is essential in fog-production.

Fog, it is admitted, is simply cloud composed of water-dust or solid minute spheres of water from $\frac{1}{7000}$ to $\frac{1}{10000}$ of an inch in diameter. It is supposed by some that a dust-particle must be a nucleus for each sphere. When we consider the billions of such spheres in a cubic inch of fog, we may well halt, and demand that the moisture in a few cubic feet of fog be evaporated, and the trillions of dust-particles massed under a microscope, where they certainly ought to be visible. The laboratory experiments advanced to prove this theory seem entirely inadequate, when we consider the extreme improbability of such an hypothesis.

It would seem as though our views as to the condensation of these fog-particles, and consequent liberation of latent heat, must be very much modified. We are told that moist air, say, at 99 per cent relative humidity, has different properties from saturated air at 100 per cent. The first, by theory, has a diminution in temperature of one degree in 188 feet vertical height; while the second, at 80°, has a diminution of one degree in 500 feet. It does not seem possible for such enormous differences to exist in two masses of moist air so near alike. It is supposed that dry air has a capacity for molecules of vapor without change of volume, and dependent entirely upon the temperature. For example: a cubic foot of dry air weighs, at sea-level, 566 grams; the same saturated will weigh 571 grams at 56°, and 576 grams at 77°. If it weighs 571 grams at 77°, we say it is half saturated. It would seem as though the arrangement of the molecules must be precisely the same in the latter case as when the humidity is 99.9 per cent or 100 per cent, except that they are in a condition, in the moister air, to unite more readily. It would be a great stretch of the imagination to consider that there is any marked difference in the condition of the molecules at 99.9 per cent and at 100 per cent.

Suppose we cool saturated air very slightly: all the molecules cannot remain as vapor, but some of them coalesce, as do globules of mercury when they touch each other. It would seem probable that if, as many admit, rain is simply the coalescing of a very great number of minute cloud-particles, we may extend the same action a step farther back, and consider that the original molecules also mechanically coalesce without setting free any latent heat. If this be so, there certainly is not needed any dust-particle as a nucleus for the mingling. We have now our air still saturated with vapor, and at the same time full of, say, double molecules of vapor. If we cool still more, the double molecules add others to themselves, and we finally have our fog or fog-particles floating in saturated air.

It has been thought that these particles (spheres) are kept in suspension very much as dust is, but this hypothesis seems untenable. Others have considered that each sphere is electrified, and repels every other sphere; and there is some color to this from the fact that a vivid flash of lightning overhead is often followed by a heavy and sudden downpour of rain. It seems probable that we can extend this hypothesis still farther back, and regard each molecule as electrified. May not the coalescing of these molecules be dependent upon their electrical state as much as or even more than upon their cooling? The principal point to be borne in mind is, however, that the formation of fog and cloud is a purely mechanical process, unaccompanied by the evolution of heat. A striking proof of this was observed during an ascent of Greylock, in Massachusetts, on Dec. 15, 1883. At the summit the wind was blowing a whole gale, and the temperature was −7°, with the air saturated but perfectly clear. In a few minutes there were just barely perceptible little white particles upon the overcoat. In a very short time the aggregation of particles, absolutely invisible to the eye, had become completely white. On the trees the particles had massed nearly an inch thick. Another proof of this mechanical aggregation is found in making observations with Regnault's dew-point apparatus. It would be supposed that as the dew-point is reached there would be a uniform deposit of molecules upon the plate; but this is not the case, as there are spaces between the dew-particles. The effect is most noticeable when hoar-frost is beautifully deposited in very marked lumps, at temperatures below freezing.

The cause of fog seems briefly as follows: 1. It is essential that there be no wind. I do not mean that the wind does not blow the fog after it is formed, but there must be little or none while it is forming. 2. The sky must be clear. We often notice a cloudless sky after a fog is dissipated. On weather-maps, "fog" is entered as "fair," for, though not a particle of sky is visible, yet it is almost a certainty that the sky is clear. 3. The air must be saturated, or nearly so. It is very surprising how rarely the last condition occurs at inland stations. A relative humidity of 95 per cent has been noted in the air, in which rain is falling, and had been falling continuously for seventeen hours. This condition almost always can occur only to the south, south-east, or north-east of a storm. At nightfall, whenever these conditions combine, there is a rapid radiation from the earth to the sky, which speedily supersaturates the overlying air; and, after that, radiation from the upper surface of the fog continues the process, and extends the fog upward until the action ceases with the rising of the sun.

H. A. HAZEN.

Washington, D.C., May 24.

Publications received at Editor's Office, May 13-25.

BACIGALUPI, E. G. Immunity through Leucomaines. Tr. by R. F. Rafael, M.D. New York, J. H. Vail & Co. 170 p. 12°.

CENTURY Dictionary, The. Vol. I. Part I. A-Appet. New York, The Century Co. 272 p. f°. $2.50.

CHURCH, I. P. Mechanics of Engineering. New York, Wiley. 832 p. 8°. $3.

COUSINS, R. H. A Theoretical and Practical Treatise on the Strength of Beams and Columns. London and New York, E. & F. N. Spon. 170 p. 12°. $5.

GREAVES, J. Statistics for Beginners. London and New York, Macmillan. 170 p. 16°. 90 cents.

GUIMPS, R. de. Pestalozzi: his Aim and Work. Tr. by Margaret C. Crombie. Syracuse, N.Y., C. W. Bardeen. 320 p. 12°. $1.50.

HAMBLETON, G. W. The Cure of Consumption. London, Ballière. 30 p. 12°.

HAYES, P. S. Electricity and the Methods of its Employment in removing Superfluous Hair and other Facial Blemishes. Chicago, W. T. Keener. 128 p. 16°.

JOHNSON, Laura Winthrop. Eight Hundred Miles in an Ambulance. Philadelphia, Lippincott. 131 p. 16°. 75 cents.

PRÉVOST, L'Abbé. The Story of Manon Lescaut and of the Chevalier des Grieux. Tr. by Arthur W. Gundry. Chicago, New York, and San Francisco, Belford, Clarke, & Co. 310 p. 12°.

ST. JOHN, E. A Postal Dictionary. New York, Evening Post. 94 p. 24°. 15 cents.

STARR, L. Hygiene of the Nursery. 2d ed. Philadelphia, Blakiston. 280 p. 12°. $1.

STOWELL, T. B. Syllabus of Lectures in Anatomy and Physiology. 3d ed. Syracuse, N.Y., C. W. Bardeen. 120 p. 12°.

TEACHER'S Outlook, The, a Monthly Magazine devoted to General Literature, Science, Health, Industrial and National Affairs. Vol. I. No. 1. Des Moines, Io., Teacher's Publ. Co. 32 p. 8°.

THOMAS, C. Aids to the Study of the Maya Codices. Washington, Government. 115 p. 4°.

U. S. GEOLOGICAL SURVEY. Topographical Maps of Portions of Oregon, Virginia, West Virginia, New Mexico, North Carolina, Nevada, Massachusetts, Texas, Maryland, Alabama, Missouri, and Kansas. Washington, Government, 1889. 28 maps, 43 by 53.5 cm.

WALWORTH, J. H. A Splendid Egotist. Chicago, New York, and San Francisco, Belford, Clarke, & Co. 246 p. 12°.

WHITTIER, J. G. The Tent on the Beach. (Riverside Literature Series, No. 41.) Boston and New York, Houghton, Mifflin, & Co. 72 p. 16°. 15 cents.