that the public demands a much brighter illumination than formerly, and this increase of illumination has by no means reached a maximum.

A NEW INSULATING COMPOUND. — The following, from the *Electrical World*, is taken from the *Chronique Industrielle*: "The compound is composed of one part of Greek pitch and two parts of burnt plaster by weight, the latter being pure gypsum raised to a high temperature and plunged into water. This mixture, when hot, is a homogeneous viscous paste, and can be applied with a brush or cast in moulds. It is amber-colored, and possesses the insulating properties of ebonite, and can be turned and polished. Its advantage is its endurance of great heat and moisture without injuring its insulating properties."

SPECIFIC RESISTANCE OF MERCURY. — Since the absolute unit of electrical resistance has been defined in terms of a column of mercury of one millimetre cross-section and of a given length, a number of determinations of the specific resistance of mercury have been made. The latest is by Messrs. Glazebrook and Fitzpatrick, and gives for a result that the resistance of a column of mercury one millimetre in cross-section and one metre long is $r = 0.95352$ B. A. units. The other results that have been obtained are —

Observer.	Date.	Value for r in B. A. Units.	Value of Ohm in Centimetres of Mercury at 0°.
Lord Rayleigh and Mrs. Sidgwick	1883	0.95412	106.23
Mascart, Nerville, and Benoit	1884	0.95374	106.33
Strecker	1885	0.95334	—
L. Lorenz	1886	0.95388	105.93
Rowland	1887	0.95349	106.32
Kohlrausch	1888	0.95331	106.32
Glazebrook and Fitzpatrick	1888	0.95352	106.29

ELECTRIC TRAMWAYS IN SALT-MINES. — In the new Stassfurt mine an electric tramway has been in operation since January, 1884. It was built by Siemens & Halske, and was a success from the start. The engine is of 20-horse power, and is placed above ground at the mouth of the shaft. The dynamo is compound wound, and gives about 40 ampères at 300 volts. The current is taken through cables to the tram-line, a distance of 410 metres. The motor is supplied from overhead iron conductors, insulated from the ground. The motor is simply one of the well-known type of Siemens dynamos, placed horizontally on a car to economize space. The dynamo supplies about 20-horse power of energy; the motor gives about 10-horse power, — an efficiency of only fifty per cent. The weight of the wagons to be drawn is about 2,500 pounds, and there are sixteen in a train. The mean speed is about six miles per hour. This line is not in any way so efficient as those that can be put up to-day, but some figures as to the cost of working are of interest, especially as the road has been long enough in operation to allow an accurate estimate to be made. In 1884, 176,196 trucks were handled; and the working cost, including all items, wages, fuel, etc., with fifteen per cent for interest and depreciation, was 10.1 pfennig (about 2½ cents) per truck, while the cost before had been 20 pfennig (5 cents). In 1887 the figures are still more favorable, as the underground electric way had been considerably increased. The cost was 8.3 pfennig (about 2 cents) per truck, or 12.92 pfennig per kilometre ton, as compared with 34.2 pfennig per kilometre ton by human labor, which the electricity displaced. If the few electric tramways in mines that are now in operation in this country were investigated as to cost, it would be found that their economy is as great as that given above. It is only a question of a few years when mule and man power in mines will be replaced by electric motors.

MICHEL EUGENE CHEVREUL, the chemist, entered his hundred and third year on Aug. 30. He is still active, and a few days ago was able to visit the Sanitary Exhibition at the Palace of Industry.

BOOK-REVIEWS.

Eclectic Physical Geography. By RUSSELL HINMAN. Cincinnati, Van Antwerp, Bragg, & Co. 12°. $1.

"THE aim of this book is to indicate briefly what we know or surmise concerning the proximate causes of the more common and familiar phenomena observed at the earth's surface. Even thus restricted, the field of inquiry encroaches to a greater or less extent upon the domains of all the branches of science. Since the study of physical geography precedes that of the sciences in most of our schools, it has been thought advisable to present, in the form of an introductory chapter, a condensed statement of the more important and fundamental scientific conceptions regarding the properties and phenomena of matter and energy, such as inertia, gravitation, cohesion, affinity, and heat, light, magnetism, and electricity."

This passage, taken from the preface, shows the scope and object of the volume under review. The different parts of the subject are treated in the order used in all books of this character. Mathematical geography forms the first part. This is followed by meteorology, oceanology, geophysics, and biology. The book is illustrated by many maps, in which the most recent discoveries and researches have been made use of, and which, considering their smallness, are quite satisfactory, and undoubtedly superior to those defacing most American text-books of geography. In a number of maps the author has preferred to omit the system of meridians and parallels; it seems to us, not to the advantage of these maps. The great number of maps, and the fact that they are copied from the best authorities available, make the book very useful to the student. The chapters on meteorology and geophysics are the best parts of the book, while in that part treating of the oceans we find many statements that are not entirely in accord with the views held by the best writers. We particularly object to the method of the author of describing theories advanced by individual authors, but not generally accepted, — for instance, Murray's theory of the origin of deep-water deposits, and Ferrel's theory of ocean-currents, — as firmly established facts. A book of the character of this 'Eclectic Physical Geography,' if giving as much theory as the present one does, ought to give the views of opposing parties, and not favor one to the exclusion of another. In Part IV. the author gives first an outline of the topography of the earth, which is generally not treated in books of this character. After a brief treatise on weather and climate, the forms of life are discussed. It seems to us that the author, in this the last part, does not do full justice to his subject, his treatment being too brief, and his views not quite clear in all respects. Evidently it is his opinion that the principal part of geography consists in the study of geophysics. The book is, on the whole, well adapted to be used in the higher grades of teaching geography, although it might have been better to treat theories less dogmatically.

The Chemical Analysis of Iron. By ANDREW ALEXANDER BLAIR. Philadelphia, Lippincott. 8°. $4.

IN this book Mr. Blair describes those methods of analysis which, in his extended experience, he has found to be of most value to the iron-chemist. The first twenty-two pages of text are devoted to the description of the necessary and most suitable apparatus; twenty-one pages treat of the re-agents; then follow detailed methods for the analysis of iron and steel, iron ores, limestone, clay, slags, fire-sand, coal and coke, and furnace gases; tables to facilitate the calculation of analyses follow; and the book ends with a very complete index.

The work is well done, the arrangement good, the descriptions clear and to the point, the illustrations excellent. It forms a manual which must prove of the greatest assistance to those entering this field of work, while those who are already familiar with this branch of technical analysis will find it a convenient reference-book, and doubtless gain from it a number of valuable suggestions.

In Fresenius's 'Quantitative Analysis' (sixth German edition) fifty-two pages of the 'Special Part' are given to methods for analyzing iron and iron ores, and Bolley's 'Handbuch' contains seventy-seven pages on the same subject; but this is, so far as we are aware, the first complete work containing between its covers not only all the best methods for the analysis of all materials directly

connected with the iron-industry, but also descriptions of the apparatus and manipulations especially adapted to the work.

A fuller discussion of the advantages and defects of the several methods given for the determination of a single element would have added to the user's satisfaction.

One is surprised to find in a work so excellent a table of atomic weights in which recent recalculations and redeterminations are ignored. According to this table, Al=27.5, Sb=122, Mn=55, Pt=197.18, etc. The error naturally extends to the table of factors, which are calculated on the basis of these atomic weights. Thus the factor for Al from Al_2O_3 is .53398, instead of .53010 as it would be with Clarke's value, Al=27.075 (O=16).

The mechanical execution of the book is, on the whole, superior to any thing we have had the good fortune to see in the way of laboratory handbooks. Heavy, fine paper, admirable press-work, and a party-colored binding make the book pleasant to the eye and hand, and — expensive. It is indeed almost too fine and costly to expose to the rude chance of laboratory disfigurement. It may be, however, that author and publisher hope, through its full-dress appearance, to promote a feeling of greater respect for nicety of manipulation in the chemists into whose hands it may come.

The book is unusually free from typographical errors; but we notice a slip of the proof-reader's on pp. 55, 56, 57, and 63, where the references to Fig. 45 should read H instead of D.

First Lessons in English. By F. B. GREENE. Philadelphia, Cowperthwait & Co. 16°.

ONE of the most difficult studies for most young persons is grammar. A few, whose minds are fitted to readily grasp abstract ideas, learn it easily and with pleasure; but to the majority it is at first irksome. This is partly due to the habit of English grammarians of laying down a mass of rules borrowed from the classical languages, and having but little application to our own tongue; but it is also in part due to the abstract and formal character of grammatical treatises, which are ill adapted to the minds of children. To remove this difficulty and make the introduction to grammar easier, books have been prepared of late years on the inductive principle, and teaching the rudiments of the science by example. Rules and technical terms are very sparingly used, and the pupil is taught the parts of speech and the construction of the sentence in so simple a way that he can hardly fail to understand them. The book before us is one of this class, and, though nothing but actual use in the classroom can accurately test its value, it seems to be well adapted to its purpose. It is illustrated, so as to make it attractive to very young pupils; and the lessons and examples are of the simple character that such pupils need. Such a work is certainly a great improvement on the elementary grammars of former days.

Old and New Astronomy. Parts I.–V. By RICHARD A. PROCTOR. London and New York, Longmans, Green, & Co. 4°.

THE present work, the first instalments of which have reached us, is intended to give an account of the science of astronomy and of its history to the general student. The work is admirably adapted to this purpose, Proctor's theories and arguments being set forth very clearly, and being illustrated by numerous good and very instructive cuts, which pre-eminently enhance the value of the book. In a brief introduction the author states his object. "It is as a subject for study and contemplation as a means for training and exercising, but likewise for ennobling and purifying the mind, that astronomy should be studied by all. It is the celestial science as viewed and studied by philosophers, as Newton and Herschel, that I propose to contemplate in the present volume." In the first chapter the history of the methods of observing heavenly bodies is described, in which discourse Proctor expounds his curious concept that the Egyptian pyramids were nothing else than immense observatories. The development of these methods is traced up to the present time. The next chapter contains studies of the earth's shape. The various proofs of the earth's curvature are explained by novel figures, among which we call attention to the telescopic view of a 'hull down' ship seen indistinctly beyond the sharply defined horizon, thus proving that it is farther distant than the horizon. In the discussion of the sun, moon, and planets, their apparent motions are first treated; and after an exhaustive explanation of the ancient theories, and the paths of the planets relatively to the earth, supposed to be at rest, Kepler's system is described and explained. Of particular interest is Proctor's elementary deduction of the perturbing action of the sun on the moon, which is used in explaining the cause of the tides. The fifth instalment treats of the methods and results of measuring and weighing the solar system. The book is very beautifully printed, and the instalments are following each other very rapidly. The matter is treated very attractively, and the mathematical deductions, which are contained in notes, are so arranged as to be intelligible to anybody who has an elementary knowledge of it.

NOTES AND NEWS.

RICHARD ANTHONY PROCTOR died in this city on Sept. 12, of yellow-fever, which he had contracted in Florida. Proctor was born at Chelsea, England, on March 23, 1837. Early in life he devoted himself to astronomy, and was a very fruitful writer. His first book was on 'Saturn and its System.' In the United States he is largely known to the public through his lectures, which he delivered in most of the larger cities. His first visit to our country was in 1873–74. He was eminently successful as a popular writer, and knew well how to make the difficult problems of astronomy attractive and intelligible to the general reader. His last work, 'Old and New Astronomy,' which is being published, is a splendid specimen of his enthusiasm for his science and of his success in imparting it to his readers.

— The Appalachian Mountain Club plans an excursion to Mount Washington, Mass.; the party, which will be limited to fifty in number, to leave on Friday morning, Sept. 28.

— E. Dubois read recently, before the French Academy of Sciences, a paper on the satellites of Mars which were discovered in 1877 by Asaph Hall. It appears remarkable, that notwithstanding the numerous observations of the planet, and notwithstanding their rapid motion and close proximity to it, they were not discovered sooner. Dubois believes that such would undoubtedly have been the case if they had existed. He expresses the opinion that two of the telescopic planets which occupy the zone between Mars and Jupiter approached the former so near that they have become its satellites. He also says that several others of these bodies may become satellites of Mars in course of time.

— F. S. Mansfield, attaché to the United States Legation in Japan, visited the scene of the eruption of the Bantaisan in Japan, of which a full report was given in the last issue of *Science*. His account, which was printed in the *Atlanta Constitution*, Aug. 26, contains the following additional details: On Sunday, the 15th of July, rumblings were heard and earth-tremors felt in the vicinity of the Bantaisan. The first disturbance noticed occurred at about 7 A.M., and was followed by three earthquake shocks at intervals of ten minutes, when there occurred a loud explosion, the noise of which the people compared to the report of thousands of cannons discharged simultaneously. At 10 A.M. the eruption was at its height, and by 4 P.M. it was over. The Japanese Government has set up a temporary hospital in a schoolhouse for the treatment of the wounded, and has organized a relief committee to look after the homeless and to recover the bodies of those who had been killed. The number of people who lost their lives by the disaster was, according to the official statement from the government relief station at Inawashiro, 518, the bodies of 70 of whom had been found, while 41 persons had been injured, and were then in the hospital at Inawashiro. The eruption occurred on the eastern side of the principal peak of Bantaisan. A portion of the smaller peak was carried away. The mud then filled up the side of the mountain, not only on the eastern side, but on the northern side as well, running down in a stream to the valley below. At the foot of the mountain each stream was about half a mile wide, gradually narrowing toward the top. The main eastern stream was divided about halfway up the mountain by a ridge, and came down in two separate volumes, the one continuing east, while the other branch came down on the southern side of the mountain, the latter stopping in the very small hamlet of Minemura, which was partially destroyed by the mud covering completely some of the houses.