Now, what is wanted is a cell with, say, the same storage-capacity and weight, — even with the same rate of depreciation, — but which has a normal rate of discharge and charge of four or five times that of the present type. We could then use from 1,000 to 1,500 pounds of battery on a car, — enough to make one or two round trips, — reduce the total weight of the car to 9,000 pounds, decrease the investment and cost of renewal three or four times, and allow the present car bodies and tracks to be used without any considerable alteration. Under these circumstances (and there is no doubt the conditions will be sooner or later attained), street-car traction by secondary batteries would be an assured and immediate success for any ordinary condition of grade.

Dr. von Waltenhofen's experiments are of interest in this connection, because of the very rapid discharges to which he subjected the Farbaky-Schenck cell, with apparently excellent results as to efficiency and freedom from harmful effects. The cell in question had seven positive and six negative plates, weighing 47 pounds, the total weight of the cell being about 60 pounds. It was constructed with a view to discharging it at 100 ampères, — five times the normal rate. The plates of this type of storage-cell have been described in this journal. They are of a modified 'grid' form, the holes being filled with a mixture of red lead and coke, or other porous material, moistened with sulphuric acid.

The cell was first completely charged, and then discharged at a rate of 100 ampères, until the potential difference at the terminals fell from 1.87 to 1.78 volts. The capacity was 166 ampère hours. Then the cell was charged at 20 ampères, and discharged at 100 ampères as before, but only 100 ampère hours were put in. 88 ampère hours were returned, giving an efficiency in ampère hours of 88 per cent. In total energy the efficiency was 77 per cent. It is evident, however, that these figures are much higher than would be obtained if the cell was fully charged. In another experiment the discharge-rate was increased to 200 ampères, the cell was charged with 200 ampère hours, and the output was about 130 ampère hours, — a current efficiency of 65 per cent, with a total efficiency of from 45 to 50 per cent. It is stated that neither of these discharges injured the cell in any way. A current of 300 ampères was then tried, and the cell kept up its potential difference reasonably well for about fifteen minutes. As to the effect the author says, "Whether this great over-exertion has been injurious to the accumulator, Messrs. Farbaky and Schenck do not state; but our experiments have shown that the cell can be discharged without injury at 200 ampères."

The author compares the performance of several types of cells, from which we get the following data: —

Farbaky and Schenck. — Capacity per pound of plate, 3.5 ampère hours; discharge-rate per pound, 2.1 ampères; total efficiency, 77 per cent (?).

Reckenzaun. — Capacity per pound of plate, 4.1 ampère hours; discharge-rate per pound, .37 of an ampère; total efficiency, 81 per cent.

Julien. — Capacity per pound of plate, 4.2 ampère hours; discharge-rate per pound, .42 of an ampère; total efficiency, 83.5 per cent.

Tudor (*at a practical discharge-rate*). — Capacity per pound of plate, 1.3 ampère hours; discharge-rate per pound, .33 of an ampère; total efficiency, 68.6 per cent.

These figures of Dr. von Waltenhofen for the Farbaky-Schenck accumulator mark an advance, and an advance that is in the right direction; but it is greatly to be regretted that the most important fact that is brought forward, namely, that the cells are not injured by such high discharge-rates, rests on a bare assertion, and no figures are given to show that a number of such discharges extending over a considerable period have been attempted.

NEW METHOD OF PRODUCING ELECTRIC CURRENTS. — C. Braun, in the *Berichte der Berliner Akademie*, describes a new method of producing electric currents. A wire of nickel is twisted into a spiral, and the two ends are connected with the terminals of a sensitive galvanometer. When the spiral is suddenly pulled out, there is a deflection of the galvanometer; and, when it is compressed, there is a deflection in the opposite direction. The direction of the current in a connected wire is determined by the direction of the twist as looked at from the end to which the wire is connected. It is stated that the effects cannot be accounted for by induction. A heating or cooling of the wire as a whole produces the same effects. If the wire is annealed, it loses its power of giving a current, but regains it again on being stretched. The effect is not large enough in diamagnetic bodies to be observed with any certainty. It seems to exist in iron and steel, but other effects make the observations difficult. If these effects exist at all, and are not due to induction, they are probably caused by the different strains on the outside and inside of a spire of the wire. It is stated that if the wire be magnetized the effect is greatly augmented.

SOME CURIOUS INCANDESCENT LAMP PHENOMENA. — The *Electrical World* publishes a letter from F. J. Crouch describing some curious effects obtained with incandescent lamps, both of whose terminals were joined to the circuit of an alternating-current dynamo. The circuit of the dynamo is made through a resistance of about 2,000 ohms (the electro-motive force is not stated). To the leads on one side of the resistance are attached both terminals of some Bernstein incandescent lamps, whose bulbs are immersed in tumblers of salt water. From the other side of the resistance, and therefore at a potential differing greatly from that of the lamps, wires are brought to the tumblers and dipped in the water. "Now, when the dynamo is started, the light appears, and the light-waves pass through the glass." The light is described as "similar to that of the glow-worm or firefly. With three Bernstein lamps, I obtained a beautiful moonlight effect, sufficient to read by in a large room." Another interesting phenomenon has been brought out in a series of letters to the same paper. It is found that incandescent lamps in the vicinity of belts or apparatus giving considerable statical discharges have a very short life. The writer has tried a few experiments to verify this. On holding near a Weston lamp (110 volts) the end of a wire connected with a Holtz machine, if the lamp be burning and the machine is turned rapidly, the filament will break in from one to five minutes. In the first lamp experimented on there was a very marked vibration of the filament, being more violent when the negative pole of the Holtz machine was presented. This lasted for perhaps a minute, when the filament broke. Some other lamps were experimented on in which there was no vibration of the filament that could be noticed; still they broke in a short time. The effect is of some practical importance in paper and other mills, and the life of the lamps can be greatly increased by putting over the bulb a wire netting connected with the earth. If the net be made of polished wire, — German silver, for instance, — there will be little or no loss of light.

BOOK-REVIEWS.

Literature in School. By HORACE E. SCUDDER. Boston and New York, Houghton, Mifflin, & Co. 16°. 15 cents.

OF the many reforms now being urged in school matters, one of the most commendable, and one which appeals to the best sense of the community, is that which urges the replacing of the literary mess now offered to the child in the usual school-reader by works of literature which have won for themselves a place. In this movement Mr. Horace E. Scudder of Cambridge has taken and is taking a leading part. Not only has he written forcibly and well on the subject, but he has himself prepared various editions of standard works fit for use in the school-room. In the present pamphlet Mr. Scudder prints his address on the subject of 'Literature in Common-School Education,' read before the National Education Association at its meeting in San Francisco in July last, and his two papers on 'Nursery Classics' and 'American Classics' respectively, which have recently appeared in the *Atlantic Monthly*. Mr. Scudder points out that literature has a field and an office of its own, and, unless it is recognized in the school, the place which it should take must remain unfilled. Literature gives expression to the spiritual and non-material wants of man, and must be brought into the foreground to counterbalance the tyranny of materialism, which bids fair, unless checked, to increase year by year. Mr. Scudder does not mean by the reading of literature in school the critical study of great authors. To urge that, would be to place a weapon in the hands of his opponents; but he says (p. 31), "The place, then, of literature in our common-school education, is in

spiritualizing life, letting light into the mind, inspiring and feeding the higher forces of human nature. In this view, the reading-book becomes vastly more than a mere drill-book in elocution; and it becomes of the greatest consequence that it should be rigorously shut up to the best, and not made the idle vehicle of the second best. It must never be forgotten that the days of a child's life are precious: it has no choice within the walls of the school-room. In its hours for reading it must take what we give it. Be sure that the standard which we set in our school reading-books will inevitably affect its choice of reading out of school; that the conceptions which it forms of literature and the ideal life will be noble or ignoble, according as we use our opportunities. It is for us to say whether the American child shall be brought up to have its rightful share in the great inheritance of America."

In the second essay, after pointing out the desirability of teaching nursery classics in school, the author says (p. 41), "The drawback to the use of these nursery classics in the school-room has been in the absence of versions which are intelligible to children of the proper age, reading by themselves. The makers of the graded reading-books have expended all their ingenuity in *grading* the ascent. They have been so concerned about the gradual enlargement of their vocabularies, that they have paid slight attention to the ideas which the words were intended to convey. But just this gradation may be secured through the use of these stories, and it only needs that they should be written out in a form as simple, especially as regards the order of words, as that which obtains in the reading-books of equivalent grade." And this fine passage serves more purposes than one to show why American classics should be read in school: "The common-school system is the one vast organization of the country, elastic, adapted in minor details to local needs, but swayed by one general plan; feeling the force of educated public sentiment, and manipulated by the free, intelligent association of teachers and superintendents. This organization affords the most admirable means for the cultivation and strengthening of the sentiment of patriotism, and it avails itself of it in many ways." We are perfectly safe in taking Mr. Scudder for our guide in the matter of literature in the schools.

Children's Stories of the Great Scientists. By HENRIETTA CHRISTIAN WRIGHT. New York, Scribner. 8°. $1.25.

THE present volume, which is accompanied by eight good engravings, — portraits of some scientists, — describes the life and work of a number of the most energetic and successful workers in natural science, the author's object being evidently to bring out the lesson taught by their lives, more than to state the results of each one's labor; at least, such we should consider the prime object of biographies of scientists intended for children. In some instances the author has well succeeded in bringing out the instructive part of the lives of these men, and these we consider the best stories contained in the book; but in others a mere compilation of events and discoveries is given, while the character and importance of the man cannot be understood from the description. Among this latter class is, for instance, the chapter on Alexander von Humboldt. Many of the discoveries of physicists as described in the book will hardly be intelligible to children, as they deal with the most difficult problems of science. As an introduction into the history of natural science, the book has, however, a certain merit. The seventeen men whose lives and works are described are the most prominent of the last centuries; and whenever the author pays attention to their struggles and sufferings for the sake of their science, as is done in many cases, the descriptions are suggestive and instructive to the child.

Our Celestial Home. By J. G. PORTER. New York, A. D. F. Randolph & Co. 16°. $1.

THIS book is written by an astronomer, and is an attempt to prove that heaven is somewhere in the stellar universe, though the author is careful not to say where. He contends, that, according to the Bible, heaven is a material place, and not merely a happy state of existence, and must therefore be somewhere in the universe that we see around us. He gives a chapter to the subject of the immensity of the universe as made known by the telescope, and then considers the question of its stability. Science, he thinks, has shown the universe to be stable as to motion, but speaks with some hesitation with regard to the forces of heat and light. The earth, he intimates, may one day be destroyed by conflagration caused by collision with some swarm of meteors, thus fulfilling the prediction of scripture. Professor Porter is wholly uncritical in his religious views; for he believes not only in the future destruction of the earth, but also in the literal resurrection of the body, in the doctrine that death is the result of Adam's fall, and much else that liberal Christians of the present day have discarded. Indeed, his book is neither religious nor scientific in the higher sense of these terms, and is not likely to make any impression on intelligent minds.

Soaps and Candles. Ed. by J. CAMERON. Philadelphia, Blakiston. 12°. $2.25.

THIS little book is one of a series of technical handbooks, of which those already published are on 'Brewing, Distilling, and Wine-Manufacture;' 'Bleaching, Dyeing, and Calico Printing;' 'Acetic Acid and Vinegar, Ammonia and Alum;' and 'Oils and Varnishes.' As in the preceding numbers of the series, the articles in 'Cooley's Cyclopædia' have formed the nucleus to which material has been added from various scattered sources. It is assumed that the reader has some knowledge of chemistry.

Examples in Physics. By D. E. JONES. London and New York, Macmillan. 16°. 90 cents.

AS the author well remarks, "it is quite common to find students who have a correct knowledge of the general principles of physics, and can apply it intelligently in making a physical measurement, but who are yet unable to solve an easy problem or to calculate the results of their experimental work." Every one who has been brought face to face with some numerical example in the course of his study of physics has had cause to regret that he has not had more practice in such work, and it is just this opportunity for practice that 'Examples in Physics' is intended to supply in its more than one thousand problems.

NOTES AND NEWS.

THE National Geographic Society signalized the beginning of the second year of its successful work by publishing almost simultaneously with its first meeting of the season Vol. I., No. 1, of *The National Geographic Magazine.* In outward appearance it is as attractive as its contents are creditable to the society, by which it is not only edited, but written. Its outward covering is of the, at present, fashionable brick-color, upon which is printed in plain type the title of the magazine, the seal of the society, and the place of publication. The paper is of good quality, and the typography clean and sharp, so the page is easily read. But the contents are most deserving of praise. Besides the opening announcement, introductory address by the president, proceedings of the National Geographic Society, and facts relating to it, there are six carefully prepared articles. Their titles are, 'Geographic Methods in Geologic Investigation,' by William M. Davis; 'Classification of Geographic Forms by Genesis,' by W. J. McGee; 'The Great Storm of March 11 to 14, 1888,' — two articles, the first a brief one, by Gen. A. W. Greely, and the second a very elaborate study of its entire history, by Everett Hayden. The latter paper is illustrated by six carefully prepared colored charts, upon which is shown graphically almost every known fact relating to this great storm. This paper, with the charts, has also been reprinted in a pamphlet. The two remaining papers are, 'The Survey of the Coast,' by Herbert G. Ogden; and 'The Survey and Map of Massachusetts,' by Henry Gannett. In the introductory announcement the editors say: "The National Geographic Society has been organized 'to increase and diffuse geographic knowledge,' and the publication of a magazine has been determined upon as one means of accomplishing these purposes. It will contain memoirs, essays, notes, correspondence, reviews, etc., relating to geographic matters. As it is not intended to be simply the organ of the society, its pages will be open to all persons interested in geography, in the hope that it may become a channel of intercommunication, stimulate geographic investigation, and prove an acceptable medium for the publication of results. The magazine is to be edited by the society. At present it will be