nected to the batteries, which really are more used for transforming the comparatively high potential employed than for storing the electrical energy. The batteries are of such a capacity that they can supply one-third of the energy required during the time that the maximum number of lights exceeds the capacity of the central station. If the maximum energy required is 600 kilo-watts, the central station will only have a capacity of 400 kilo-watts; the battery supplying the remaining 200 when it is needed, and being charged when the demand falls below 400 kilo-watts, the capacity of the station. It will be found, however, that this plan does not utilize the storage-battery to the full extent possible, as the central station will be idle for part of the twenty-four hours. What it does, however, is to diminish the size of the central station and equipment by one-third, and allow the electrical energy to be distributed at a high potential, by comparatively small conductors. The potential Mr. Crompton proposes to use is in the neighborhood of 450 volts, a value which seems rather low.

For the alternating system a potential of 2,000 volts is assumed, with a transformer for every one or two houses. Calculating the cost of installing the above plants, Mr. Crompton finds that the alternating system will come to £57,440; the direct system, with storage-batteries, £59,762. In calculating the running expenses it is assumed that the batteries deteriorate only fifteen per cent per year, an extremely low estimate. The following is the estimate of working expenses for a year: —

	Accumulator.	Transformer.
Materials (coal, etc.)	£2,517 os. od.	£4,648 os. od.
Labor and salaries	1,995 0 0	2,608 8 0
Maintenance of plant	4,086 10 0	4,683 5 0
Total	11,939 13 0	8,598 10 0
Cost per unit	3.75d	2.7d

These results, provided they were true, would be very encouraging, since they would allow electric lights to be sold at a price that would correspond to gas at seventy-five cents per thousand, with an extremely handsome percentage on the original outlay. Mr. Crompton has omitted in his estimate the cost for rent and attendance at the battery stations, — items that would add about £1.000 per year to the accumulator account, but which would still give a balance in its favor. While in this country the conditions of distribution are different, a plant of 10,000 lights being smaller than would be built in any large city, yet the comparative values given will not be greatly modified; and when we consider that here the distribution of power must be taken into account, and credited to the direct system, — power distribution being impossible at present with alternating currents, — the moral of Mr. Crompton's figures seems to be that the alternating system has no place in densely populated centres, but must be relegated to towns and the suburbs of cities, where there is a field for it as wide as its most enthusiastic disciples can wish.

ELECTRIC STREET-CARS IN BALTIMORE. — In the last few weeks a car equipped with electric motors and storage-batteries has been running in Baltimore, with a success that promises at least a systematic experiment to determine the expense and the value of the system. The condition of the street-railway tracks in Baltimore — the heavy grades and sharp curves — is such that the demand on a secondary battery is very trying; there is also a heavy demand on the motors, which must develop as much as 20-horse power for considerable distances. In order to avoid too heavy a discharge-rate from the battery, a larger number of cells are employed than would be ordinarily used. The details of the equipment are as follows: the car is a large sixteen-foot car, furnished with two Sprague motors of 7½-horse power each, capable of working up to over 10-horse power. The gearing is the ordinary gearing of the Sprague system, and has been described in this journal. The weight of the motors and gears is about 1,600 pounds. The battery consists of 126 cells placed beneath the seats, arranged in boxes of nine cells each. The cells are of the grid type, manufactured by the Accumulator Company under the patents of Faure, Sellon, Swan, etc.; the Electrical Storage Company of Baltimore having the patent rights for Maryland, the District of Columbia, and West Virginia. The cells weigh about 4,200 pounds, and the total weight of the car is 13,000 pounds. Before the car was tried, there was considerable doubt, even among members of the company, whether it would successfully take the heavy grades that the track offers. It has been running, however, for several weeks with excellent results: it ascends the steepest grades with ease, and much faster than do horse-cars; there is very little noise; the car is under most perfect control; and, as far as performance goes, it is a decided success. The question of cost has yet to be settled. If we take a number of cars, and if the street-car company supplies its own power, the cost per car per day for power will not exceed $1.75, counting all the expenses excepting only the deterioration and handling of the battery. As the cost of horse-power per car per day for the same service is not less than $6, the margin for repairs and attendance is about $4.25 per car per day. Whether that amount will suffice can only be determined by trial; but if every precaution is taken, and if the battery and motor are properly designed for the work they have to do, it is probable that the expenses will not be greater than the cost of horses. As to the increased comfort, there is no question.

SUSPENSIONS FOR GALVANOMETERS. — Dr. G. A. Liebig, in an article in the *Electrical World*, gives the results of some experiments on different kinds of silk for galvanometer suspensions. If ordinary silk fibres be used to suspend delicate astatic systems, there will be found some trouble from capricious movements of the needles. Dr. Liebig shows that these are probably due to two things. In the first place, an ordinary fibre of silk obtained from a cocoon consists of two single fibres surrounded by a "gummy substance of a gelatinous nature," the last making up about one-third the bulk of the fibre. The disturbing effects seem due to, in the first place, not separating the two parts of the double fibre; and, in the second place, to the changes in the outer gelatinous coating from moisture, etc. The remedy lies in using only a single fibre, and in washing it in hot water, dissolving off the coating. The variety of silk known as 'tussus' is especially recommended, a single fibre being able to sustain from five to seven grams, as against two grams for ordinary silk.

BOOK-REVIEWS.

Ancient Legends, Mystic Charms and Superstitions of Ireland. By LADY WILDE. Boston, Ticknor. 12°. $2.50.

THE present volume contains a great number of legends and current beliefs of Ireland, collected by an enthusiastic lover of the island and of its people. Many of the legends were directly obtained from oral communications, and the simplicity of the style in which they are told adds to their attractiveness. The contents of the volume are of great variety. A number of legends treating mainly of fairies and kindred subjects is followed by a description of festivals and myths referring to their meaning and origin. Marriage rites and mortuary customs are fully described, and in reading these we were much pleased with the author's remark that there is nothing derogatory to grief in the idea of hired mourners. "On the contrary," she says, "it is a splendid tribute to the dead to order their praises to be recited publicly before the assembled friends; while there is something indescribably impressive in the aspect of the mourning women crouched around the bier." It is this endeavor of the author to present usages, superstitions, and beliefs from the standpoint of those who hold to them, which makes the book particularly valuable, and attractive to the reader. It seems to us that the author has been eminently successful in this attempt. A special chapter treats of medical superstitions. A comparison of these remarks with Mr. Mooney's paper mentioned in a recent number of *Science* will be of interest. Legends referring to the sidhe and banshee receive special attention, while there are comparatively few treating of the saints and their exploits. The theories of the author regarding the origin of the various legends and customs occupy only a small portion of the book, and will hardly stand a severe test. The appendix, which treats principally of the antiquities of Ireland, of early Irish art and the ancient

capital, — is full of enthusiasm for the early history of the country. Appended is the address of Sir William Wilde to the Anthropological Section of the British Association, delivered at Belfast, 1874.

Alden's Manifold Cyclopedia of Knowledge and Language. Vols. I.–V. New York, Alden. 12°. 50 cents per vol.

THE most striking features of the present cyclopædia are the handiness of its volumes and its cheapness, which will make it accessible to the general public. Another remarkable feature of this work is the combination of the characteristics of a cyclopædia and of a dictionary, including in its vocabulary every word which has a claim to a place in the English language. The sources from which it draws are the standard cyclopædias and dictionaries, and therefore the contents of the various titles are probably accurate. A considerable number of illustrations have been inserted in the text for illustrating the subjects treated. Considering the marvellously low price of the volumes, the printing is very satisfactory, the type being clear and sufficiently large. In selecting the titles, and in their treatment, special attention has been paid to the wants of the American public; and those who are unable to procure one of the expensive large cyclopædias will find this work useful. So far, five volumes have been issued, bringing the cyclopædia up to the word 'brave.' The work, when completed, will consist of about thirty volumes.

Practical Hints for Draughtsmen. By CHARLES WILLIAM MACCORD, New York, Wiley. 4°. $2.50.

"THE leading object of this treatise is to explain various modes of representation, which are in many cases better than the precise ones of projection." These words of the preface define clearly the scope and object of the present volume, which is of the greatest value to the student of mechanical drawing. The author is particular in emphasizing the fact that the object of the draughtsman is not to make such drawings as are correct from a theoretical point of view, but working drawings that will serve the purposes of the workman, and that the method will be best which reaches this object with the least outlay of time and labor. These principles are so sound, and their application is set forth so clearly, that the book must be recommended to all students of mechanics. The author, recognizing the difficulty of laying down the rules in which it is advisable to deviate from the laws of projection, shows in a great number of examples in which way the working drawing ought to differ from a correct projection, and emphasizes especially the necessity to omit details which are of no use to the workman. The maxim, which he advocates most strongly, that each view should be made to tell all it can, but that nothing should be put in it which does not tell something worth knowing, ought to be kept in mind by every mechanical draughtsman. A special chapter is devoted to the representation of bolts, nuts, screws, and rivets. His hints for sketching will be found eminently practical. In an appendix a description is given of drawing-instruments, intended as a guide for selecting a good set. Although we agree with the author's opinion in a general way, we cannot concur in his wholesale condemnation of instruments adapted for special purposes.

Memoranda on Poisons. By THOMAS HAWKES TANNER. 6th ed. Rev. by Henry Leffmann, M.D. Philadelphia, Blakiston. 24°. 75 cents.

TANNER'S 'Memoranda on Poisons' is so well known, that it is only necessary to call attention to the differences which exist between this and former editions. The principal changes that we notice are the substitution of modern chemical nomenclature for the older style, and the revision of the toxicology of poisonous food. Although this book is specially intended for those engaged in actual medical practice, it will be found to be a valuable addition to every library, containing as it does, in a very condensed form, the symptoms and treatment of poisoning in its many forms.

NOTES AND NEWS.

THE value of the work now doing by the United States Geological Survey will be appreciated when it is known that the engineer of the Denver and Rio Grande Railroad located its line through the passes of the Wasatch Mountains from the government maps without sending out parties to determine the best route. The engineer of the projected line from Los Angeles to Salt Lake City made similar use of the National Survey maps; and, wherever engineering-work is to be done in territory which has been covered by the survey, it has been found to be of the highest practical usefulness.

— Eight field-parties left Washington on Sunday to begin the work of the National Survey for the season on the Pacific coast. Three have gone to the gold-belt of California, under the direction of Mr. H. N. Wilson; two to the Cascade Mountains in south-western Oregon, under Mr. W. T. Griswold; and three to Montana, under Mr. J. M. Douglass. The charts they are making of California are on a scale of two miles to an inch, and those of Oregon and Montana four miles to an inch. The California parties will cover an area of about two thousand miles each during the season, and those in Oregon and Montana from three thousand to four thousand miles each. The parties that are going to south-western Oregon are to work in a region which it is believed will develop into a great gold-bearing country. It has already yielded a large amount of placer gold, but the gold-bearing quartz has not yet been developed. The survey will probably direct attention to it, and cause its rapid development. The work of the Montana parties will be about the head waters of the Missouri River, where the floods originate which cause so much damage along the lower Mississippi; and in addition to mapping the country and noting its topography, etc., they will make a special examination of the water-shed, to determine where dams can be built to hold back the destructive floods. Attention will also be given to the use of the water thus stored in irrigation. All triangulation upon the Pacific coast has to be completed early in July, before the summer haze sets in. This strange phenomenon has never been satisfactorily explained. It seems to be a mixture of smoke and dust, filling all the valleys, and rising thousands of feet into the air. It obstructs the view so that no point over five miles distant can be distinguished.

— May 1, the local committee of the American Association for the Advancement of Science, together with a number of the leading citizens of Cleveland, met in the Board of Education rooms in the Public Library Building to make arrangements for the meeting to be held in Cleveland next August. Prof. C. F. Mabery of the Case School of Applied Science took the stand as temporary chairman, and in a few preliminary remarks introduced Prof. F. W. Putnam, the permanent secretary of the association, who gave a most interesting history of the association and its objects. The officers of the local committee are: president, Cady Staley; vice-presidents, Hon. John Sherman, Hon. H. B. Payne, Pres. H. C. Haydn, Gov. J. B. Foraker, Col. John Hay, Mayor B. D. Babcock, Hon. Samuel E. Williamson, Mr. W. J. Gordon, Gen. M. D. Leggett, Mr. L. E. Holden; secretary, Elroy M. Avery, Ph.D. Committee on post-office, telegraph, and express: Prof. A. H. Tuttle, chairman; Capt. F. A. Kendall, secretary. Committee on the press: Prof. Bernadotte Perrin, chairman; Prof. A. H. Thompson, secretary. Committee on printing: C. G. Force, chairman; Dr. Elroy M. Avery, secretary. Committee on membership: Hon. C. C. Baldwin, chairman; Rev. Jabez Hall, secretary. Committee on invitations, receptions, and excursions: Mr. W. R. Warner, chairman; Newton M. Anderson, secretary. Finance committee: Mr. Solon Severance, chairman; Mr. Charles A. Post, secretary. Committee on rooms: Prof. Edward W. Morley, chairman; Prof. Herbert C. Foote, secretary. Committee on hotels and lodgings: Mr. Edward H. Fitch, chairman; Mr. Harry P. Cushing, secretary. Committee on transportation: A. J. Smith, chairman; Elroy M. Avery, secretary.

— The Texas State Geological and Scientific Association, which has for a number of years endeavored to arouse a general interest in the geological exploration of Texas, has memorialized the State Legislature, asking that it be made the agent of the State for carrying on geological work, and that a director be appointed to supervise such work. The ground which the association takes is so clear and reasonable, that it must recommend itself to the legislators. It is proposed to explore principally the deposits of minerals of economic value, and thus to give the citizens of the State that knowledge of the real value of the land they hold which they