8 inches high. This acted as a calorimeter, the amount of water required to charge it being 1.76 pints. In order to charge the explosion-cylinder, it is first filled with mercury, which is allowed to run out, the explosive mixture of air and gas taking its place. The explosion was caused by an electric current passing through the wire in the top cover. The result of a large number of experiments led to the conclusion that the average calorific power of well-purified illuminating-gas, as generally stipulated for by the concessions of French gas companies, is about 5,200 calories per cubic metre. This is equal to 584 British units per cubic foot. The standard of 6,000 calories, hitherto generally accepted, would therefore be too high. M. Witz's experiments more nearly accord with those recently made by Mr. Dugald Clerk, who estimated 504,888 and 489,268 foot-pounds per cubic foot as the mechanical equivalents of Manchester and London gas. This would correspond to 5,640 and 5,372 calories per cubic metre. M. Witz found that the calorific power of gas supplied from the same works varied considerably, at different seasons of the year ranging between 4,719 and 5,425 calories; but the average of tests showed that the difference between the gas supplied by various works was not great. The purification of the gas reduces the calorific power by more than 5 per cent. The gas produced during the last hour of a charge is inferior in heating-power to that obtained during the first hour. The heating-power of gas may be increased 77 per cent by carburation; but the gasoline employed becomes rapidly less volatile, and, when reduced to one-fourth its volume, its enriching-power is only 34 per cent. The details of the experiments, which appear to have been made with every precaution to insure accuracy, have been given in the *Annales de chimie et de physique* for 1885, and are quoted in the abstracts of foreign papers of the Institution of civil engineers.

REMSEN'S INTRODUCTION TO THE STUDY OF CHEMISTRY.

THE difficulty encountered by those who desire to have science which is true science taught in the high schools and academies of this country has been the lack of good teachers and of suitable books. Gradually, however, the books are appearing. Such volumes as those of Gray on botany, Guyot on physical geography, Dana on elementary geology, Martin on physiology, and others which we might name, are excellent examples of the skill with which men of acknowledged distinction as scientific men have prepared text-books adapted to youth in their teens. The influence of such books is to awaken a love of the observation of nature, and to show the scholar how, from simple phenomena, he may proceed to those which are difficult and complex. The improved condition of American school-books is sure to have a lasting effect upon the future citizens of this country. Already the increasing love of scientific studies and pursuits is manifested in a hundred ways.

Professor Remsen has now prepared a chemistry which is intended for those who are beginning the study. No one will question his learning or his experience. For many years his daily round of the laboratory has made him familiar with the perplexities and difficulties which are encountered by students of every grade, — the bright and the dull, the immature and the adult. It sounds paradoxical to hear him declare at the beginning of his work, that, in face of the serious difficulties which lie in the way of a purely scientific treatment of chemistry, he thinks it possible to treat the subject more scientifically than is customary, and thus to make it easier of comprehension.

He therefore lays down as his guiding principle a desire to develop a scientific habit of thought; and this cannot be accomplished either by haphazard, and disconnected experimenting, or by considering the profoundest theories before the student is fitted to comprehend them. The proper course is to begin with an orderly sequence of laboratory lessons, to be performed, if possible, by every pupil for himself, and, if this is not possible, then by the teacher in the presence of a very small class, — not more than ten or a dozen persons.

This volume is therefore prepared as a manual for the laboratory of beginners. The cost of the requisite apparatus is not large, and is quite within the allowances of all superior schools, either for girls or boys. The beginning of the course is very easy; but it soon grows harder, and requires for its conduct a teacher who has himself been trained in laboratory methods. The self-taught chemist will be a very awkward guide. Such an instructor will find his work made delightful by the orderly, progressive steps which are marked out for the class to follow. At frequent intervals questions are interposed which the student himself must answer from his own observation and reading. Enough information is given to make his investigations easy and profitable, not enough to stifle independent thought. The author's doctrine is that a badly performed experiment is as objectionable as a bad recitation or a badly written exercise.

Introduction to the study of chemistry. By IRA REMSEN. New York, *Holt*, 1886. 12°.

By the use of methods like these, chemistry is likely to hold its proper place in an educational curriculum. It should not be play, — a mere mode of whiling away the time in a series of entertaining surprises ; and it should not be drudgery, — the attempt to master a series of names and formulas ; but the science should be presented to the beginner as it appears to the advanced investigator, as the orderly, prolonged, well-guided study of certain classes of phenomena, in order that the laws which govern them may be discovered and applied.

In the opinion of the writer, which is based upon many years of observation of the study of chemistry as a part of a general education, the volume before us is admirably adapted to the purpose in view. Chemistry thus studied will be found an admirable discipline ; and, if the scholar goes no further than to master the pages of this little volume, he will carry with him through life a clear conception of the methods of scientific study, and will thus be saved from many of the perplexities which have beset many scholars whose training has been exclusively based upon books, and who may, unfortunately for themselves and unfortunately often for the world, have been filled with horror at the progress of science. A single year of laboratory work will do more than the mastery of a cyclopaedia to assure the scholar of the truth of modern investigations.

COMPAYRE'S HISTORY OF PEDAGOGY.

To many persons the endeavor to treat teaching and the practice of education generally in a scientific manner seems nonsense. They liken teachers to poets, who must be born, not made, and fall back upon mother wit and natural instinct as the sole requisites for a good teacher. But teaching is not a new occupation : our principals and primary teachers are not the first to impart instruction to children. In fact, teaching is as old as civilization ; and it would be strange indeed, if, in all these centuries, no experience that is worth any thing to us had been acquired. Education has been carried on under almost every possible variation of conditions, whether they be geographical, political, social, religious, ethical, or only personal. Human nature has an infinite number of phases, but its essentials vary but little from era to era. Therefore it would be more than strange, it would be miraculous, if the problems that confront our educators to-day had not been more or less dimly perceived and more or less successfully met in the past. Unless a teacher proposes to begin all over again, and try to repeat in his own experience the experience of the race, unless he proposes to test all possible methods, and fall into all the old errors, he certainly ought to be acquainted with the history of his profession. This is placing the desirability of a training in pedagogics on the lowest ground, — that of mere utility. It leaves out of consideration all that great philosophers have said and done concerning education ; it takes no account of the relations existing between pedagogics on the one hand, and psychology, ethics, and politics on the other.

For the purpose of giving a general knowledge of past educational theories and practices, we know of no book so useful as the 'Histoire de la pédagogie' of M. Compayré, which Professor Payne has so opportunely translated. Grassberger's volumes are essential to a detailed knowledge of education in Greece and Rome. Schwarz and Niemeyer are excellent so far as they go, Von Raumer is minute on the great German educators, Schmidt's four volumes are classic, and Kloepper's little compend is an excellent manual ; but Compayré's book, while not too special and technical to be uninteresting to the general reader, is full enough for the average teacher. We have only one serious fault to find with it, — it is written by a Frenchman. As a consequence of this, the writings of French educators are unduly prominent, and the course of the history of pedagogy is conditioned more or less by the history of France. This is, of course, a patriotic view, but a one-sided one. Since the Renaissance, educational progress has been international ; and, if any one nation is to have the place of honor, that nation must be Germany. It is in Germany that the tenets of humanism, realism, philanthropinism and naturalism were most thoroughly developed and put into practice. Sturm was a German ; Comenius, Ratich, Lessing, Pestalozzi, Fichte, Herbart, Beneke, Froebel, — to pick names at random, — were all Germans ; and Germany, not France (despite the unsurpassed influence of Rousseau), should be most prominent in the history of pedagogy.

Apart from this faulty stand-point, there is little in M. Compayré's history to criticise. It is too brief, perhaps, in its treatment of the great schools of the middle age, but it is correspondingly full on Rousseau. We should be glad to have seen more on the great universities, especially those in Italy and Paris. Rollin, whom the German pedagogues are apt to overlook, receives his proper recognition here. The chapters on the education of women are among the most interesting in the book, and are, if we mistake not,

The history of pedagogy. By GABRIEL COMPAYRÉ. Tr. by W. H. Payne, A.M. Boston, *Heath*, 1886. 12°.