read "place them so that any two corresponding sides are parallel." In p. 63, ex. 19, for "prove also that OT, ON equal OP^2," read "prove also that OT.ON equals OP^2."

Diagrams of Mean Velocity of Uniform Motion of Water in open Channels, based on the Formula of Ganguillet and Kutter. By Prof. Irving P. Church. 11 Diagrams +1 page Text. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1902.)

THIS little work, in spite of its ponderous and somewhat ambiguous title, is a useful and workmanlike collection of curves from which may be obtained the value of the mean velocity v in the empirical formula $v = c\sqrt{rs}$, so much used in computing the flow of water in channels.

To the ordinary reader the term "mean velocity of uniform motion" is puzzling; but anyone versed in hydraulics will understand that the author wishes, very properly, to restrict the application of his curves to cases where the rate of flow is constant, *i.e.* where the same number of cubic feet or gallons pass a given section of a channel of uniform cross-section every second.

In the formula the trouble is with the coefficient c, which is not independent of r and s—the hydraulic mean depth or "hydraulic radius" and the slope. The coefficient may be computed, for channels of different materials, from well-planed timber to earth and stones, by the formidable law of Ganguillet and Kutter,

$$c = \frac{\frac{1{\cdot}811}{n} + 41{\cdot}65 + \frac{{\cdot}00281}{s}}{1 + \frac{n}{\sqrt{r}}\left(41\,65 + \frac{{\cdot}00281}{s}\right)},$$

where n is the arbitrary constant which ranges in value from 0·009 to 0·035 in the two extreme cases cited.

Very few people, we imagine, actually calculate c in this way, as tables by Trautwine and others give its value for all likely values of n, r and s. Prof. Church has, however, gone a step further, and his diagrams give values, *not* of c, but of v, thus avoiding the further calculation usual after c is found from tables.

There are eleven diagrams, each corresponding to a particular value of n, the vertical lines in each diagram showing "slopes," inclined lines "hydraulic radii," and horizontal lines "mean velocity" v. The intersection of any three of these lines satisfies the relations referred to, and shows for the selected values of n, r and s the required mean velocity in feet per second, which, multiplied by the cross-sectional area of the channel in square feet, gives the flow in cubic feet per second.

A test or two, worked out from the formulæ, shows the curves to be accurate enough for practical purposes.

Thus, selecting $n = {\cdot}01$, $r = 10$, $s = 2{\cdot}0 \div 1000$, the calculation gives

$$c = \frac{\frac{1{\cdot}811}{{\cdot}01} + 41{\cdot}65 + \frac{{\cdot}00281}{{\cdot}002}}{1 + \frac{{\cdot}01}{3{\cdot}162}\left(41{\cdot}65 + \frac{{\cdot}00281}{{\cdot}002}\right)} = \frac{224{\cdot}155}{1{\cdot}136} = 197{\cdot}3$$

and

$$v = 197{\cdot}3\sqrt{10 \times {\cdot}002}$$
$$= 27{\cdot}89 \text{ feet per second.}$$

The diagram gives v about 28.

In another test where $n = {\cdot}03$, $r = 10$, $s = 2{\cdot}0 \div 1000$, the diagram gives v about 10·5; calculation makes it 10·38.

There is no doubt, therefore, that Prof. Church has compiled a real "labour-saver" for those who have to make numerous calculations of the kind referred to.

Near the end of the author's explanation he mentions the application of the diagrams to cylindrical pipes and sewers "running full or half-full." We would point out that the rule $v = c\sqrt{rs}$ is not applicable with success to pipes running full, though various American writers attempt to use the law in this sort of universal sense. Much more authentic formulæ are available for calculating the flow in pipes, and the curves given in this little work should not be applied to that purpose. R. G. B.

A First Course of Chemistry (Heuristic). By J. H. Leonard, B.Sc. Pp. vi + 134. (London: John Murray, 1902). Price 1*s.* 6*d.*

THIS little work provides a course of elementary chemistry resembling the well-known course which was drawn up some years ago by Prof. Armstrong and endorsed by a British Association committee. Great pains are taken to make the teaching undogmatic and to imbue the pupil with the zeal of a scientific inquirer. The topics include a study of chalk, lime and carbonic acid, air, water, combustion, acids and salts. Though the work cannot be pronounced superior to some that have already been written with the same object, it gives a good representation of what many people now think the right way of approaching elementary chemistry. On any system the teaching of elementary chemistry will for long remain full of difficulties and inconveniences. We notice that on p. 43 there is an instruction to collect oxygen by displacing air in an inverted cylinder, and on the next page an experiment, correctly enough described, perhaps, leading to the conclusion that oxygen is lighter than air. A. S.

An Elementary Book on Electricity and Magnetism and their Applications. By Profs. D. C. Jackson, C.E., and J. P. Jackson, M.E. Pp. xi+482. (New York: the Macmillan Company; London: Macmillan and Co., Ltd., 1902.) Price 7*s.* 6*d.*

THE object of the authors has been to write a book which will serve both as an elementary text-book and as an interesting account of the subject for the general reader who has a taste for the science. With this in view they have naturally taken industrial development as a guide, and wherever possible have shown the connection between the simple principles of the science and their technical applications. As the general reader is usually ill-equipped with mathematics, we find that little more than the simplest equation is used in the book.

Each chapter is followed by questions. Here are some of the questions which come at the end of the first chapter:—

"How much is known about the real constitution of electricity?"

"What is electricity supposed to be by some scientists?"

"What kind of electricity will a positively charged ball induce?"

The book contains twenty-three chapters, and from chapter xv. to the end the subject-matter is principally technical applications. Thus polyphase motors, electric welding, cooking and Röntgen rays, and other new uses are each described in their appropriate chapters. S. S.

The Face of Nature. By the Rev. C. T. Ovenden, D.D. Pp. ix + 188. (London: John Murray.) Price 2*s.*

IN this little volume we have the material for several "popular readings in elementary science," the subjects of the four chapters being weather forecasting, vegetable life, the record of the rocks, and stones from boulder clay. The village clergyman or teacher who desires to show that there are "sermons in stones" and other natural objects and phenomena will find Canon Ovenden's short addresses of service.

A few points will, we think, lead to misconception if accepted as they now stand. For instance, a barometer is said to weigh the air, whereas it really measures pressure. Again, it is only true in the northern hemisphere that a "cyclone spins always against the hands of a clock, and the anticyclone rotates with the hands of the clock."