of the strip, and y_2 and y_3 are the ordinates trisecting the base (whose length is l). The general rule is, then, simply to divide the area into any number of strips and apply the above formula to each strip. Why bother to remember the result obtained by summing, and why base each rule upon a set of several strips and then have to remember whether the rule requires the total number of strips to be a multiple of two or three?

But this criticism, in common with several above, is directed more at current practice than at the particular volumes under review. In fact, the text is one of conspicuous merit, which not only promises to give good results, but also gives every indication of representing a course already taught with a high degree of success.

F. L. GRIFFIN.

Die angewandte Mathematik an den Deutschen mittleren Fachschulen der Maschinenindustrie. Von Dipl.-Ing. KARL OTT. Band IV, Heft 2, Internationale Mathematische Unterrichts-Kommission. Leipzig, Teubner, 1913. vi + 158 pp.

CONFESSIONS of faith are much in vogue these days with politicians, all of whom desire to be considered progressive. The author of the pamphlet under review uses considerable space, especially at the beginning, to create the proper atmosphere around the definite points of view from which the work of the particular schools on which he is reporting is to be judged. And in the confession of the principles of his faith he uses the words of Runge, of Göttingen, to express himself. Freely translated and condensed, these principles are about as given below.

The problems of applied science requiring mathematics call for quantitative results. Abstract and formal results are not sufficient. They must be correct to the proper decimal place. They should check. Accuracy and efficiency must obtain. Form and logical sequence must be seriously considered. . . . Suitable methods whether graphical, numerical, or mechanical are necessary. The province of applied mathematics is to furnish such suitable methods. And the field is not at all to be considered as apart from pure mathematics but a part of it. It is simply a question of a different state of mind handling its problems efficiently. To all of which the author adds in his own words that the engineering student must have a thorough understanding of the fundamental principles of the mathematics he applies and be able to reason clearly along technical lines. However, he need not go into the full theory (abstract) of all the principles. An engineer may not be familiar with the writings of Carnot or Clausius, but he should be familiar with the thermodynamic principles they discussed and have had much experience in their application. Empirical methods and results arise and are well worth while. . . .

The schools under consideration arose because technical industry required them. They are strongly influenced by actual engineering practice, and of late years the Verein Deutscher Ingenieure has helped outline their programs and general engineering training.

The province of this special report is limited to those studies in a technical course in which the mathematics involved forms the back-bone. These are technical mechanics, including mechanics of materials, graphic statics, hydraulics, machine design, thermodynamics, and a general study of the problems of electrical engineering. The following is a composite program in a typical government school of the type under discussion.

First semester: Statics. Technical mechanics, with applications to mechanics of materials. Elements of graphic statics. 6 hours per week.

Second semester: Dynamics of rigid bodies. 6 hours per week.

Third semester: Hydraulics. Thermodynamics. 6 hours per week.

The methods of the seminar and laboratory play an important rôle in the instruction, while design as handled in this country meets with the author's warm approval.

Students enter differently prepared. The cry about the inability of some of their students to handle the fundamental principles of trigonometry, powers and roots, quadratics, logarithms, etc., sounds very much like the tale of woe uttered by our own instructors of freshman mathematics. Some schools require for entrance the equivalent of our customary first year mathematics, others offer a preparatory course. It takes a year, as with us, to obtain an efficient homogeneity of ability and preparation.

Some of the schools carry pure mathematics (analysis) and the applied mathematics at the same time; some try to correlate; others try the spiral method, where the principles are reviewed in the light of the principles of the calculus. With others the calculus is not studied as a separate subject and mechanics is handled by laboratory methods. In general the calculus is studied later than is the practice in our country and the whole plan of procedure is not outlined as definitely as with us. The case is worse in the private schools of similar kind. Undoubtedly the situation calls for instructors of ability to handle the applied mathematics—or to side-step its problems with agility.

The subject matter during the first half year must necessarily be quite elementary, and there are evidences of ingenious ways of dodging the rigors of the calculus. On the other hand there are equally ingenious demonstrations of a "near calculus" which in the nature of things must always arise in actual engineering problems. Definitions, approximations, experiments, mensurations, rules, formulas, instruments, models—all are used. Most excellent aids—all of them; but should they be first aids?

Examinations are given at the end of the course. These are partly oral, partly written. They are in charge of special committees of school officials and other dignitaries, including the instructors. The typical examination papers shown seem to be not at all as difficult as the average semester examinations on similar work in our technical schools.

A chapter on texts in use, their strong and weak points, is given. A list of reference works and journals is included. Slide rules, planimeters and models used in teaching are discussed. Typical methods of handling fundamental principles naturally calling for the calculus without its aid are illustrated. Graphical methods with special reference to graphic statics receive much encouragement.

Descriptive geometry here, as in our technical schools, aims to develop the students' power to see space relations. The curriculum seems not to include the mathematical treatment of the subject which so many critics have declared desirable. ERNEST W. PONZER.

Astronomy, A Popular Handbook. By HAROLD JACOBY. The Macmillan Company. xi + 435 pages.

THIS book has a broader purpose than its title would seem to indicate. It is intended to be suitable not only for the