Hydro-Electric Power, Vol. 1, Hydraulic Development and Equipment. By Lamar Lyndon. Published by McGraw-Hill Book Co., Inc., New York. First edition, 1916. 499 pages, 235 figures, 6x9 ins., cloth. Price, $5.00 net. (Reviewed by Arthur Surveyer, M.Can.Soc.C.E., consulting engineer, Montreal.)

In the last few years many books have been published in the United States on hydro-electric practice, and almost each new volume has been an improvement on the previous works. This new book by Mr. Lamar Lyndon, which has for companion a second volume on "Electrical Equipment and Transmission," is no exception to this rule. It is also a great improvement on the other book published on the same subject, by the author, in 1908, and entitled "Development and Electrical Distribution of Water-Power." In this new book has been included the most recent important contributions which have appeared in the technical publications with the possible exception of Robert E. Horton's new category of coefficients of roughness for use in Kutter's formula, and Mr. Schaefer's "German Studies of Uplift Pressure on Masonry Dams." In his preface, the author states that it has been his intent "to produce a work for the guidance of the engineers in the practical design of hydro-electric plant, which would have a character of accuracy, clearness and completeness." The author has thought it advisable to repeat occasionally in different parts of his book, both statements and conclusions, as well as the meaning of the symbols used in the formula. The reason given for this modification is that treatises of this character are seldom read through consecutively, but are used for reference, and that it is both an annoyance and a waste of time to search through every part of a book for data on some single subject. The writer feels sure that this feature will be much appreciated by engineers who have been compelled in the past to read half a book in order to find out what a symbol meant in a formula, or what were the previous conclusions. The value of the book is also greatly enhanced by the numerous numerical examples given in the text.

The first chapter deals with general conditions and does not contain any new matter. The second chapter treats of the flow in streams and the run-off from the basin. The author gives the following method for determining the probable high-water discharge: "If a line of levels be run which shows the slope of the level of the water surface as indicated by the marks left by the flood, and several cross-sections be taken, sufficient data will be obtained to compute, within practical limits, the flow at the time of the flood." This appears to the writer as a very doubtful method, as a very slight variation in the slope would cause the calculated flood discharge to vary within excessive limits. As noticed above, this chapter does not include Horton's values for *n* in Kutter's formula, but only the old-time table which gives nine subdivisions only. It contains, however, a very valuable method for the determination of the back-water curve caused by a dam. The formula given is much simpler than Bresse's old formula and apparently more accurate than Dupuit's, both of which have been doing service for over half a century. In the measurement of stream by floats, Mr. Lyndon refers only to the surface float method, which is not very accurate, and does not refer to the submerged float method nor to the rod float method, which are both more dependable. The Mississippi River was gauged by Abbott and Humphrey by the submerged float method, and valuable formulæ for the discharge of rivers deduced from these observations. The writer has used both the submerged and the rod float method, with good results, to measure volumes of over 100,000 cubic feet per second.

Chapter 3, entitled "Weirs and Orifices," refers to the flow over weirs of various shapes and to the discharge through sluice gates and penstock intakes. The coefficients of discharge through sluice gates given as the result of experiments made in India and at Lowell, Mass., vary from .74 to .95 and appear very high to the writer. A coefficient of 0.62 has long been considered as a fair average when contraction took place on four sides and 0.80 when contraction was entirely suppressed.

Chapter 4 deals with "Power Variation and Storage"; Chapter 5, on "Artificial Waterways," contains valuable information on the flow through canals, the limiting velocity of water for various materials, seepage losses in canals, etc. The subject of open flumes is very well handled and the analysis given of the stresses in wooden flumes includes the stresses in the trestle work. Concrete flumes are also analyzed and complete method of calculation given. This information is not easily found elsewhere and is very valuable.

Chapter 6, "Pipe Lines and Penstocks," is a very important one; it contains the calculation of the different losses in pipes, also the determination of the size of the pipe and the computation of the discharge for a system of varying cross-section. The author gives a formula for the calculation of the distance between penstock supports which he does not consider satisfactory. Mr. R. A. Wright gave one in "Engineering News" of February 10th, 1910, in an article entitled "Steel Supports," which appears to fit the problem better.

Chapter 7, on "Dams," is perhaps the most important of the whole book. The problem is very well presented and the explanations clearly given. The author considers that the effect of the uplift force (due to hydrostatic pressure under the base) is substantially negligible and that any failure of a dam, by overturning, must be assigned to other causes. He argues that the most dangerous condition that must be provided against is, full pressure at the upstream edge and no pressure at the toe. This uplift pressure applying only over 25 per cent. of the area of the base. The arguments brought forward sound convincing, but they are in contradiction with the results of some experiments made at the Oester and Neye dams in Germany to determine the uplift pressure and summed up by Mr. Schaefer in an article entitled "German Studies of Uplift Pressure on Masonry Dams," which was abstracted by Mr. Alfred W. Hoffmann in "Engineering and Contracting" of September 22nd, 1915. The two dams examined were built on rock foundation of grey wacke and slate of widely varying description. The conclusions arrived at by Mr. Schaefer are that "every dam is subjected to some uplift pressure, even if the greatest care has been exercised in the selection and preparation of the foundation." Mr. Schaefer recommends that in the designing, the full hydrostatic pressure due to the maximum head be assumed at the heel and one-half the pressure at the toe, the pressure being effective over the entire area and decreasing uniformly from the heel to the toe. A dam is to be considered safe and stable if the resultant does not pass closer to the toe than ⅙ the width of the base. Applying the methods suggested by Mr. Schaefer to the dam described and shown by Mr. Lyndon on page 198, we find that instead of having a factor of safety of about three, as is the case when the Lyndon method is followed we have a factor of safety smaller than unity and a resultant falling outside the base. This chapter also includes valuable discussion on foundations