Book Reviews

A History of Greek Fire and Gunpowder. J. R. Partington. Heffer, Cambridge, England, 1960. xvi + 381 pp. Illus. + plates. 70s.

The history of Greek fire and gunpowder is one of the few subjects in the history of chemistry and technology in which many people are interested, yet it is particularly here that much misinformation has strangely persisted. Not so long ago, even such an outstanding historian and explosives expert as Tenney L. Davis published some analyses, carried out to the second decimal point, of gunpowder identified as "8th century, Marcus Graecus," and he remained quite undecided about Berthold Schwarz. Now that we have Partington's great work, misinformation should rapidly disappear and indecision should be left to those questions which still remain open.

Partington develops the story from the sources, and the difficulties in understanding these sources may explain the history of errors in the field. Some of the difficulties are in the translation of the old documents. Partington cites sections from them in the original languages, including Greek, Latin, French, German, and Spanish. For example, the Chinese word *huo p'ao* was often translated as "cannon," even in translating documents dating back to a time before the word acquired that meaning. M. Berthelot once translated a word that may have meant "impure potash from burnt barley straw," as "barley." Arabic *bundūq* gradually changed its meaning, in time, from "hazelnut" to "firearm." Translating old documents is difficult, and even Partington errs at one point. He discusses names of guns and mentions Dulle Griete in Ghent (1382) with the aside "(griete = great)" (page 128). Actually, however, *Griete* is *Grete* (Peggy or Maggy). A few pages before, Partington cites Christine of Pisa (1363–1431) as saying that guns were usually given female names, for example, *Garite* = Margaret! Naturally such a minor slip is here mentioned in the spirit in which Horace complained that sometimes Homer slept.

Together with the meaning of single words, the general attitude of the old authors has to be considered. Fire and explosion were terrifying experiences, easily exaggerated into fabulous tales. Chinese reports of 1345 describe the siege of a city in 1277 when the discharge of a cannon made the walls crumble and the 250 defenders disappear "without a trace," while the soldiers outside the city died of fright (page 244 ff). An accidental explosion under Akbar in 1367 hurled the bodies "miles away" (page 220).

In some instances, uncertainty about dates has to be added to all these difficulties. This is particularly true for the *Book of Fires of Markus the Greek* which Partington discusses in the second chapter, after "Incendiaries in warfare." This Markus is shown to be "a purely imaginary person" (page 40). The real author of the book was a Jew or a Spaniard, of the 12th or 13th century, who combined old and "new" information, that on gunpowder being the newest of all.

"The legend of Black Berthold" (chapter 3) had already been exposed by G. Köhler in 1887 and by M. Berthelot in 1891. Yet records of the 15th century treat him as a real person, a Dane or a Greek; an imaginative, 15th-century picture of him hangs in the Uffizi Museum in Florence, and a monument erected to him in Freiburg (Baden) claims him for Germany. Partington is rightly critical of those German military historians—for example, Berthold Rathgen (1847–1927)—who allowed national prejudice to influence their otherwise scholarly work.

"Now that the ghost of Berthold Schwarz had been laid and the record of 1313 for Ghent and, as will be seen presently, one of 1324 for Metz, removed as forgeries, we are left in suspense" (page 96). We are left with 1326 as the date for the earliest gun; this gun is shown in a manuscript by Walter de Milemete at Christ Church, Oxford, and is reproduced here as the frontispiece. A few guns were used by the English in the famous battle of Crecy (1346), but the noise was perhaps more effective than the shot (page 105). From then on, reliable reports about guns become more frequent, although other reports are quite doubtful. Chapters 4 and 5 abound in details on firearms and gunpowder. The military history of the Crusades and the sieges of Constantinople and Nikopolis are fully discussed. A fine description of gun casting from Kristoboulos, "1467 or later," is given (page 125 ff).

The long description of what has been reported and argued concerning pyrotechnics and firearms in China (chapter 6) concludes with first dates of about 900 for saltpeter, 1044 for a "proto-gunpowder," and true gunpowder only when it was also known in the West. That gunpowder was used "in different parts of the world" was stated by Roger Bacon in his *Opus Tertium,* 1266-68 (page 77).

One of the crucial points is to know when the words in the old texts really mean saltpeter. Partington discusses this in several places and devotes the final chapter to the discovery and manufacture of saltpeter. Since some of the ancient words interpreted as saltpeter also signify alkali (soda), an excursion on soap is included. "A satisfactory history of soap has still to be written" (page 309). The text ends with a compilation on compositions of gunpowder. The work of Berthollet and Berthelot is mentioned, but the several intermediate investigations—for example, by Proust shortly after Berthollet and by Bunsen before Berthelot—are missing.

The scholarly apparatus is impressive. Of the more than 1700 notes, some are quite extensive. The four indexes will help the reader to find his way through the complex story. Such a guide is necessary, because Partington has not always hewn a straight path through the jungle. Sometimes he retraces his steps or changes the focus on time. Yet, a careful reading of his book will be highly rewarding in many respects. All historians, not only those of chemistry and technology, will need it, and the general reader can find much to capture his interest. A lot of incidental information is presented, such as that on shrapnel—named after its inventor,

Lieutenant Henry Shrapnel, R.A., in 1784 (page 166)—or on the amazing predictions by Roger Bacon (page 72) and Giovanni da Fontana (page 160 ff). A particular joy are the general remarks with which the book is liberally sprinkled: on scholasticism (page 64) or on governments and history (page 187).

This rich and many-dimensional book is a highly valuable addition to Partington's outstanding historical work.

EDUARD FARBER
4530 Brandywine Street, NW, Washington, D.C.

Metallurgical Society Conferences. vol. 1, *Flat Rolled Products*. Rolling and treatment. T. E. Dancy and E. L. Robinson, Eds. xix + 128 pp. Illus. $3.75. vol. 2, *Reactive Metals*. W. R. Clough, Ed. xiv + 610 pp. Illus. $15. vol. 3, *Quality Requirements of Super-Duty Steels*. R. W. Lindsay, Ed. x + 309 pp. $8.50. vol. 4, *Physical Metallurgy of Stress Corrosion Fracture*. Thor N. Rhodin, Ed. xiii + 394 pp. Illus. $13. Interscience, New York, 1959.

Under the series title, *Metallurgical Society Conferences,* proceedings of technical conferences sponsored by the Metallurgial Society of the American Institute of Mining, Metallurgical and Petroleum Engineers are being published by Interscience Publishers. The first four volumes include: volume 1, *Flat Rolled Products*; volume 2, *Reactive Metals*; volume 3, *Quality Requirements of Super-Duty Steels*; and volume 4, *Physical Metallurgy of Stress Corrosion Fracture*. Additional volumes on recent and forthcoming conferences are scheduled for publication and the continuing series will cover the entire spectrum of metallurgy. Publication of the conference volumes serves to preserve and make widely available the scientific and technical information presented at the conferences.

The first volume contains four papers on rolling and annealing of steel, together with discussion of the papers and a panel discussion on the surface texture of flat rolled products; this is the proceedings of a conference-symposium held at Chicago, Ill., on 21 January 1959. The applied technical information presented at the conference and recorded in volume 1 is available in no other publication and will be of interest to anyone concerned with flat rolling of steel.

Volume 2 is the proceedings of the third Reactive Metals Conference, held at Buffalo, N.Y., 27–29 May 1958. Thirty-seven papers and the discussions that followed are presented. The topics cover a wide range of subjects on 11 reactive metals and the special processing techniques necessary for these unusual metals. Engineers concerned with nuclear reactor materials; moderately high-temperature, light-weight structures; and very high temperature structures will find the material in volume 2 useful in their work.

The proceedings of a technical conference on quality requirements of super-duty steels, held in Pittsburgh, Pa., 5–6 May 1958, are recorded in volume 3. Steels to meet special service requirements, such as very high strength, high temperature, or low temperature are considered. Four papers were presented in sessions on each of the following general topics: environment of use and required properties; relationship between composition structure and properties; air melting practices; special steelmaking practices. Volume 3 contains information helpful to both the producer-metallurgist and the consumer-metallurgist in understanding each other's quality requirements.

A symposium on the physical metallurgy of stress corrosion fracture was held at Pittsburgh, Pa., in April 1959; and the proceedings were published as volume 4 of this series. This volume contains 16 papers by well known workers in the stress corrosion field. It will be a welcome addition to the library of all those concerned with stress-corrosion.

O. CUTLER SHEPARD
Department of Metallurgical Engineering, Stanford University

Shots without Guns. The story of vaccination. Sarah R. Riedman. Rand McNally, Chicago, Ill., 1960. 232 pp. Illus. $3.50.

Man's war against his unseen enemies makes no less exciting reading than his battles against visible foes, especially when told by an author who combines insight into the scientific and human aspects of the fight against disease with a sense for the drama involved in the adventures of the giants who waged this fight. Whether the inquiring Jenner, the genial Pasteur, the meticulous Koch, the imaginative Ehrlich, or the cautious Salk is pictured, the portraits are always impressive and lively. While we are fascinated by the life history of the heroes who conquered ignorance and disease, we refresh our memory or learn new aspects of bacteriology, virology, and immunology.

FRANCIS JOSEPH WEISS
Arlington, Virginia

Anatomy of Seed Plants. Katherine Esau. Wiley, New York, 1960. viii + 376 pp. Illus. $6.95.

Katherine Esau is a plant anatomist of distinction, with a particular interest in the developmental anatomy of flowering plants. In 1953 her well-known *Plant Anatomy*, a book of 735 pages, was issued by John Wiley and Sons. The present briefer text is very welcome, for the older book, with all its many virtues, fell short, owing to sheer volume, of being an ideal text for a one-semester course. The present text is not a condensation of the older book but has been entirely rewritten, and fewer than 20 percent of the illustrations are from *Plant Anatomy*. The nature and sequence of the topics, after two short introductory chapters on the embryo and the development of the adult plant from the embryo, do not differ radically from those of the *Anatomy*: histology of tissues; primary and secondary growth in root and stem; the leaf, flower, fruit, and seed. The emphasis, wherever possible, is on development. The photomicrographs used as illustrations are scattered through the text instead of being concentrated at the end, as in the *Anatomy*. In general, the illustrations are of the high quality we have come to expect from Katherine Esau, but a few are too greatly reduced, and one plate of photomicrographs is poorly reproduced. The student who judges from the size of this relatively slender volume that his powers will not be taxed unduly will be badly deceived, for this is a tight, closely written book, into which the author has packed an astonishingly large mass of information. Among the innovations are a key to the microscopic identification of certain woods and a very extensive and useful glossary.