After describing briefly the manner in which this problem was solved by countries which were similarly situated as India is to-day, warning is given that it may turn out to be a mere waste of time and energy to concentrate on researches connected with industries which have been already highly developed elsewhere. Finally, indication is given as to what type of industrial researches are likely to prove most useful at the present time.

The Editorial is followed by a number of articles of a technical nature. These may be divided into two groups—those dealing with problems in Heavy Electrical Engineering and those dealing with problems in Light Current Engineering. In the first group there is an interesting article by Prof. E. W. Marchant describing the recent development in the Liverpool University Laboratories, thus giving information on the progress that is being made in the teaching of Electrical Engineering in Great Britain. In the second group there is an article entitled "Whistling Meteors" which reports a very interesting discovery made by the Research Department of the All-India Radio.

The articles on the earthing of neutrals and on an alteration to an X-ray unit, as also the note on Kelvin's Law, should be specially interesting to the field engineers. Standard tests on broadcast receivers form the subject-matter of an article which describes the equipment and the procedure adopted in carrying out these tests, while in another article are described briefly the processes of manufacture of fixed resistors for radio purposes. There is a topical article on the "Cyclotron", its construction and use.

Towards the end of the issue a special section is devoted to the Department of Electrical Technology, Indian Institute of Science, which gives useful and interesting information for all those connected with the Department. Other interesting items are, Book Reviews, List of Members of the Electrical Engineering Society, etc.

The Journal is maintaining its usual high standard both as regards the nature of the contents and the get-up and an important point which may be mentioned in this connection is that this is the only journal of its kind published in India.

Manufacture of Dry Cells in India. Bulletin No. 23 of Indian Industrial Research. By Joglekar, Subbramaiah and Verman.

This Bulletin is the result of more than six years' research carried out by three workers in the Research Department of the Alipore Test House. It gives a brief account of the theory of dry cells and goes on to describe in some detail their construction and operation and the raw materials and machinery used for their manufacture. The methods used for testing dry cells, defects and their remedies, etc., are also described. A short account of the economics of dry cell manufacture is also included and the Bulletin concludes with an excellent bibliography of the available literature on the subject which will be of very great use to would-be manufacturers and others interested in dry cells.

The information given in the Bulletin will serve as an excellent introduction to scientists, manufacturers and others who are not very familiar with the subject, but it is very doubtful if it will enable any one, who is not already something of an expert in the line, to produce dry cells of good quality without carrying out a considerable amount of experimental work himself. On the other hand, it is only fair to point out that would-be manufacturers could probably get any information not found in the Bulletin by consulting the authors. Most of the technical information contained in the Bulletin will be found scattered in the literature. There are a few important points, however, worth mentioning. One of these is a process (patented by two of the authors) for activating natural manganese dioxide which enables the output of dry cells to be increased by fifty per cent. Such activated manganese dioxides have been on the market for some years but were hitherto entirely of foreign origin. The authors have also devised a number of hand- and power-operated machines, for the various operations involved in the manufacture of dry cells such as the rolling of the zinc, the pressing of the dollies, etc. These machines are illustrated in the Bulletin and will no doubt prove very valuable.

A few errors of omission might perhaps be pointed out. No mention is made of the fact—well known to manufacturers of dry cells—that the state of hydration of the manganese dioxide has a profound influence on its depolarizing properties. Other things being equal, it has been found that a highly

hydrated ore has much better depolarizing properties than an ore with less water of hydration. In the account given of "Gelatinizing substances", no mention is made of potato starch which is a much better gelatinizing agent than maize starch or wheat flour. It is also rather disappointing to find that nothing has been said about a somewhat novel type of dry cell using magnesium chloride instead of the usual ammonium chloride. The "Pertrix", a German make of cell, belongs to this type and was claimed to possess several advantages, over the ammonium chloride cell, particularly with regard to shelf life, a very important factor to be considered in tropical countries. On the whole, the Bulletin is a very useful publication and every would-be manufacturer of dry cells ought to possess a copy.

C. V.

CENTENARIES

Halley, Edmund (1656-1742)

EDMUND HALLEY, a British astronomer, was born at Haggerston, London, November 8, 1656. He was educated at St. Paul's School and at Queen's College, Oxford. At the latter place he specialised in astronomy so remarkably that he was only 19 when the Royal Society accepted his first paper on the *Orbits of primary planets*.

The preparation of a new star catalogue was his ambition. But finding that project already pursued by Havellus and Flamsteed, he planned to supplement their work by the addition of the stars round the South Pole. For this purpose, he left the university before he had taken any degree and sailed for the island of St. Helena in 1676. He returned home with his catalogue of stars in 1678 when the Royal Society elected him a fellow, and Charles II gave him a mandamus to the University of Oxford for the degree of A.M.

His application for the Savilian professorship of astronomy at Oxford was rejected in 1691 on religious grounds.

Having visited the continent and having sailed in the Atlantic on various scientific missions he ultimately succeeded Dr. Wallis as professor of geometry at Oxford in 1703. Here he soon employed himself in translating from Arabic to Latin the works of Apollonius. In 1721 he succeeded Flamsteed as Astronomer Royal and devoted the next eighteen years to the duties of his office, hardly ever missing an observation.

One of the most remarkable services of Halley to science is the part he played in bringing Newton's *Principia* to the notice of the world. In January 1684 Wren offered Hooke and Halley a prize in the shape of a book worth 40 shillings if they would deduce the elliptic orbit from the law of inverse squares. Halley went to Cambridge and asked Newton, "What path will a body describe if it be attracted by a centre with a force varying as the inverse square of the distance?" Newton at once replied, "An ellipse with the centre of force as one focus". "How on earth do you know?" asked Halley in amazement.

"Why, I have calculated it", Newton said and began searching for the paper.

Halley found the papers to form a complete treatise on motion in general. With this burden of transcendental value, he hastened to the Royal Society, who wrote to Newton asking leave that it might be printed. When the consent came, Halley himself saw it through the press and met the entire cost.

The long life of this versatile man was devoted completely to the enrichment of several departments of knowledge both as an original contributor of 84 papers to the *Philosophical transactions* and as the Assistant Secretary and Principal Secretary of the Royal Society from 1685 onwards. His papers were all collected in three volumes under the title *Miscellaneous curiose*. His reputation as an astronomer rests on his discovery of the long inequality of Jupiter and Saturn and of the acceleration of the mean motion of the moon, on his prediction of the return of Halley's comet and on his suggestions for determining the solar parallax from observations on the transit of venus. His contributions to physics relate to terrestrial magnetism and optics. In pure mathematics, which he pursued only in leisure hours, he investigated the properties of loxodromic curve, first solved the problem of describing a conic section of which the focus and three points are given, improved the method of constructing curves of the third and fourth degrees and devised a new method for the tabulation of logarithms. His extensive voyages laid the foundation of physical geography and particularly meteorology. As the compiler of the *Breslau table of mortality*, he takes rank as the virtual originator of actuarial science.

In 1737, Halley was struck with paralysis in the right hand and when he was in the act of drinking a glass of wine, he expired in his chair without a groan, January 14, 1742.

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