

Investigating the Causes of Steam-Boiler Explosions. These many appointments to places of responsibility are evidences of the rare sagacity, skill, sound judgment, and integrity of character which were qualities conspicuous to all who knew him well or dealt with him in his various duties. Upon taking charge of the Cambridge Observatory, he proceeded with energy to complete its equipment, adding to its already famous resources a meridian circle, constructed in accordance with his designs by Throughton and Simms of London—an instrument whose performance has been pronounced by competent judges the best of its kind in the world. The distinguished astronomer, Adams, of Cambridge, England, subsequently ordered an instrument from the same makers to be constructed on the same model. Prof. Winlock also secured for this Observatory a very perfect astronomical clock, made by Frodsham of London, from which, through contrivances of his own, true time is telegraphed to neighbouring cities. He also set the famous equatorial instrument of the Observatory upon a new career of usefulness and glory in astronomical spectroscopy. In 1870 he put into regular working efficiency a mode of observing the sun—namely, by a single lens, a heliostat, and photograph—which he independently conceived, and was the first to utilise as a form of systematic observatory work. French astronomers have lately been contending with one another about priority in the conception of this method of observation, which was so important a part of the equipment for observing the transit of Venus last December furnished to American expeditions; but in all that really constitutes effective originality, the honour of this invention undoubtedly belongs to Prof. Winlock. He was, however, almost entirely indifferent, in the singleness of his devotion to his favourite science, to popular fame, or even to contemporary recognition. Besides his observatory work, he was engaged on two occasions in the direction of expeditions to observe solar eclipses—namely, that to Kentucky in August 1869, and that to Spain in December 1870. Though ingenious as an inventor, his judiciousness was so much more prominent a quality that his originality is shown rather in a thoroughness and detailed efficiency of contrivance than in the more brilliant qualities that distinguish the more famous inventors. Very numerous little but very effective improvements in astronomical methods distinguish the astronomical art of the present day; and in these Prof. Winlock's originality was considerable. Among his published works, besides the "Annals of the Observatory" under his directorship, are a set of tables of the planet Mercury (arranged with characteristic neatness and ingenuity); brief papers in astronomical journals and in the *Proceedings of the American Academy of Arts and Sciences*. He was a native of Kentucky, and the grandson of General Joseph Winlock, who entered the American army at the beginning of the Revolutionary War, and also served in the war of 1812, and was a member of the convention which drew up the constitution of the State of Kentucky.

INDIA MUSEUM, SOUTH KENSINGTON

THE India Museum, which was opened in South Kensington last month, was founded by the Court of Directors of the Honourable East India Company in 1798. In 1860 it was removed from Leadenhall Street to Fyfe House, and in 1869 to the India Office. The galleries of the Exhibition Building, in which it is now temporarily lodged, have been leased from H.M. Commissioners for the Exhibition of 1851 for three years. The lower gallery is devoted to Raw Products, and the upper gallery to Manufactures. The present arrangement of the India Museum Collections is to a large extent only temporary, and fulfils mainly the purpose of bringing them into view preparatory to their final classification. The preparation of Descriptive Catalogues will

go hand in hand with the completion of the different groups.

A handy little penny Guide has in the meantime been officially issued, which will be found of considerable service in enabling the visitor to make a systematic inspection of the large collections which have been for so long stowed away in various cellars and ware-rooms in the topmost story of the New India Office. Now that this Museum has been brought "to the light of common day," and that the public has a chance of estimating the value of its treasures, we are sure that when the lease of the Exhibition rooms expires, permanent accommodation will be allotted to it, we hope in connection with an India Institute so ably advocated by the Director of the Museum, Dr. Forbes Watson. On four days of the week the charge for admission is only one penny, and sixpence on the other two days. We purpose at present to give some account of the Botanical and Zoological Collections in the Museum.

Room No. 1 is devoted to the commercial products of the vegetable kingdom, with the mechanical appliances associated with their cultivation, collection, or preparation, and is under the superintendence of Dr. M. C. Cooke. A complete collection of these products is exhibited in small tin cases with glass fronts, which are arranged in metal frames, and suffice to give a general view of the productions of the country. Supplemental to this the principal trade articles receive special illustration in a more extended manner in central cases. As this is a new feature in the arrangement of this section, it will take some time before it can be fully and properly developed. What has been done with cotton will in part illustrate what is intended with other products. In this instance the cotton is shown from all parts of India, at first in the boll, then in the seed; afterwards cleaned, together with the seed and oil therefrom, with the waste obtained in the processes of cleaning and spinning and its economic applications. The processes of spinning are next illustrated, with the resultant twists and yarns. These are succeeded by grey and bleached cloth, printing blocks, samples of dyed and printed fabrics, and coloured yarns. Underneath these cases are arranged the agricultural implements employed in the cultivation of cotton, churkas and rollers for cleaning it from the seed, models of spinning wheels and other appliances illustrating the manipulation of the cotton fibre. Above the cases are displayed drawings of the varieties of cotton plants, and of the natives at work at the different processes through which the cotton passes from the ploughing of the soil to the complete woven fabric. By this mode the whole history of the progress of cotton from first to last is exhibited at one view, or at least as much of it as could be compressed within available space. Hitherto, although agriculture, and especially its food products, has been fully illustrated, forestry has not had by any means the share which its importance demands. It is contemplated therefore to expand this new division considerably by the addition of collections of the timbers of the three presidencies and of native states, each by itself, so as to show the character of the forests in each division, accompanied by maps and drawings or photographs of the trees. The products of the forests, other than timber, will be shown collectively for the whole of India, accompanied by such diagrams, drawings, and statistical tables as may be necessary; and the fungoid pests and enemies of arboriculture will also be illustrated. Already this illustrative mode of exhibition has commenced, but will evidently proceed slowly, as diagrams, drawings, and tables will have to be constructed, and probably some of the illustrations must be obtained direct from India.

It may be remarked that Cinchona Bark from the Neilgherry plantations, as well as from Kangra, has the honour of a case to itself, and it is hoped that soon another important drug recently introduced—Ipecacuanha

—will be represented by samples grown in India. The economic plants introduced into India must necessarily form an important feature in its trade museum. Amongst trees *Eucalypti*, the baobab, cork oak, mahogany, have not as yet produced marketable results; but tea, cinchona, senna, nutmegs, pepper, cinnamon, cloves, barley, tapioca, the Maranta arrowroot, Orleans and Egyptian cotton, with their hybrids, Carolina rice, &c., are a few of the instances in which the successfully introduced plants have added, or promise to add, considerably to the exports of India. In the development of the natural resources of so vast a region undoubtedly much remains to be accomplished. Passing through this room, a great number of such unknown, undeveloped, or unappreciated objects will not fail to impress themselves upon the attentive observer. Surely with such vast forests, and a system of conservation so steadily pursued, more ornamental and furniture woods are destined to be exported than yet find their way to the coast; and there are at least sound timbers little inferior to teak, such as *Hopea odorata* is said to be, which require only to be more widely known to be more generally appreciated. In resinous products the European markets are as yet but little indebted to the forests of India, but the copals here shown from *Hopea odorata* and *Hopea micrantha* give considerable promise. The wood oils produced by several species of *Dipterocarpus*, and the Burmese lacquer derived from *Melanorrhæa usitatissima*, might be obtained in large quantities, and yet hitherto no practical application for them in this country has been discovered. The latter is employed to a very great extent in Burmah for lacquering furniture and small wares, but it is unsuited for the English process.

Amongst the objects in this room of interest to the botanist rather than to the general public may be cited the Tabashir, a siliceous secretion from the joints of the bamboo; the curious horn-shaped galls called Kakrasinghee, produced on a species of *Rhus*; manna obtained from *Tamarix indica* in the North-west Provinces, and a kind of manna named Shirkhist from the Punjab, attributed to the *Fraxinus floribunda*; the resin somewhat resembling Elemi, derived from *Boswellia Frereana*, which the late Daniel Hanbury considered one of the ancient kinds of Elemi, but which is disputed on good grounds by Dr. Birdwood; narcotic Indian hemp in different forms, including the Churru or hemp resin, and various confections into which it enters; the clearing nuts which are employed by natives in clearing water, and are the seeds of a species of *Strychnos*. To which may be added the paper-like bark of *Betula bhojpatra*, used in Northern India as a wrapper for cigars; the bark of one of the species of *Daphne*, from which the renowned Nepal paper is made, and the singular natural sacks made of the bark of *Aniatis saccidora*.

The models of native implements associated with the respective "products," drawings and photographs of the mode of using them, the copious illustrations of plants from whence useful substances are derived, and especially the series of photographs of forest trees, are calculated to increase the public interest in this collection, and add to its usefulness, although these features are not yet developed to the extent or in the systematic manner which they are intended to assume.

Rooms Nos. 4 and 5 contain the zoological collections, under the superintendence of the assistant curator, Mr. F. Moore. In it are comprised the various collections of Mammals, Birds, Insects, &c., contributed by officers of the old East India Company, whose names have been distinguished by their labours in this branch of natural history, of whom may be mentioned Buchanan, Cautley, Finlayson, Hodgson, Horsfield, McClelland, Raffles, Roxburgh, Russell, Wallich, &c.

Commencing with the Mammals, in Room No. 5, the various tribes have been so arranged in the several cases

that the visitor at a glance may see the principal species in each group. From want of space, however, many of the larger species are at present precluded from being exhibited, and it is proposed to substitute photographs and other illustrations of them.

Following in order come the Birds, which have also been arranged in a similar manner, each group or tribe being represented by prominent and characteristic species.

In this room are also deposited the cabinets of Insects, several groups of which are provisionally exhibited in the window recesses, as well as an unique collection of Indian forest insect pests.

The tribes of Reptiles and Fish are shown in Room No. 4, and, though at present but few species are represented, this section will shortly be enriched by the extensive and valuable collections formed by the Inspector-General of Indian Fisheries.

Supplemental to these groups, which are arranged in a scientific series, these rooms contain an important collection of economic animal products, including an unique series of the silk-producing insects, lac, honey-yielders, and gall-making insects of India, and their several valuable products, as well as groups of pearl-oysters, chanks, wools, plumes, horns, ivory, &c.

For a series of fossils and plaster casts from the Cautley and Falconer collections, as well as the collections of shells and Crustacea, no cases have as yet been erected for their reception.

THE BIRDS OF GREECE *

THE third part of Mommsen's Griechische Jahreszeiten is devoted to an article upon the birds of the classical land, to our better knowledge of which Herr Mommsen's work is intended to contribute—an article which will be quite as interesting to naturalists as to the scholars for whom the periodical in question is primarily designed. The memoir is based upon the notes and observations made during his long residence in Greece and the adjoining parts of the Levant by Dr. Krüper, a naturalist well known to all students of European ornithology for his accurate and painstaking investigations of the birds of those countries, and especially for his discoveries of the breeding haunts of some of the rarer species. Dr. Krüper's notes have been further augmented in value by the co-operation of Dr. Hartlaub, of Bremen, one of the first of living ornithologists, who has contributed the references to the previous authorities upon each species, and a list of the existing memoirs relating to the same subject, besides adding many extracts from former writers to Dr. Krüper's observations.

The total number of species of birds noticed by Dr. Krüper in the present memoir is 358, on each of which notes of a more or less extended character are given. The arrangement adopted for the sake of convenience is that of Linder-mayer's "Vögel Griechenlandes," published at Passau in 1860, and hitherto generally recognised as the best authority upon Grecian ornithology. Dr. Krüper's memoir must now, however, be referred to as more complete, and contains many recent additions to Linder-mayer's list. We observe, however, that the work extends into limits which cannot (at any rate at present) be called Greece in its modern sense, as Dr. Krüper's recent discoveries in the neighbourhood of Smyrna of such birds as *Picus syriacus*, *Sitta krueperi*, and *Coscypha gutturalis* are introduced into it. It is, however, a matter of great convenience to ornithologists to have Dr. Krüper's notes upon the Birds of Greece and the Levant, many of which have been scattered through the pages of half a dozen periodicals, reduced into order under such excellent superintendence. Dr. Hartlaub's

* Griechische Jahreszeiten; unter Mitwirkung Sachkundiger, herausgegeben von August Mommsen. Heft iii. Schleswig, 1875.