

vided for fifty cadets, who, in addition to performing the ordinary routine work of the ship, will be instructed in the duties of the navigator and seaman as required on board a first-class modern ship. Strict discipline is to be maintained on board, and the cadets will be at all times under the supervision and guidance of the instructors. The addition of the *Vivid* to the equipment of the school provides opportunities for the practical testing of the theoretical work of the lecture-room under actual seagoing conditions, and the vessel, in fact, furnishes the laboratory which in every other department of applied science has long been considered an essential adjunct to efficient instruction.

In framing the scheme of instruction, the governors of the college have kept in view the fact that owing

BIOLOGICAL WORK IN INDIA.

ALTHOUGH the mosquito-destroying capacity of the small cyprinoid fishes known to the Spanish inhabitants of Barbadoes as *milliones* appears to have been considerably overestimated, naturalists in India are convinced that many of the smaller fresh-water fishes of that country play an important rôle in this respect. Experiments have been carried on for the last few years by officials of the Indian Museum with the view of procuring exact details on the subject, and the result is a report, published by order of the Trustees, on "Indian Fish of Proved Utility as Mosquito-destroyers," drawn up by Capt. R. B. S. Sewell and Mr. B. L. Chandhuri, in which eleven species are scheduled with such descriptions and

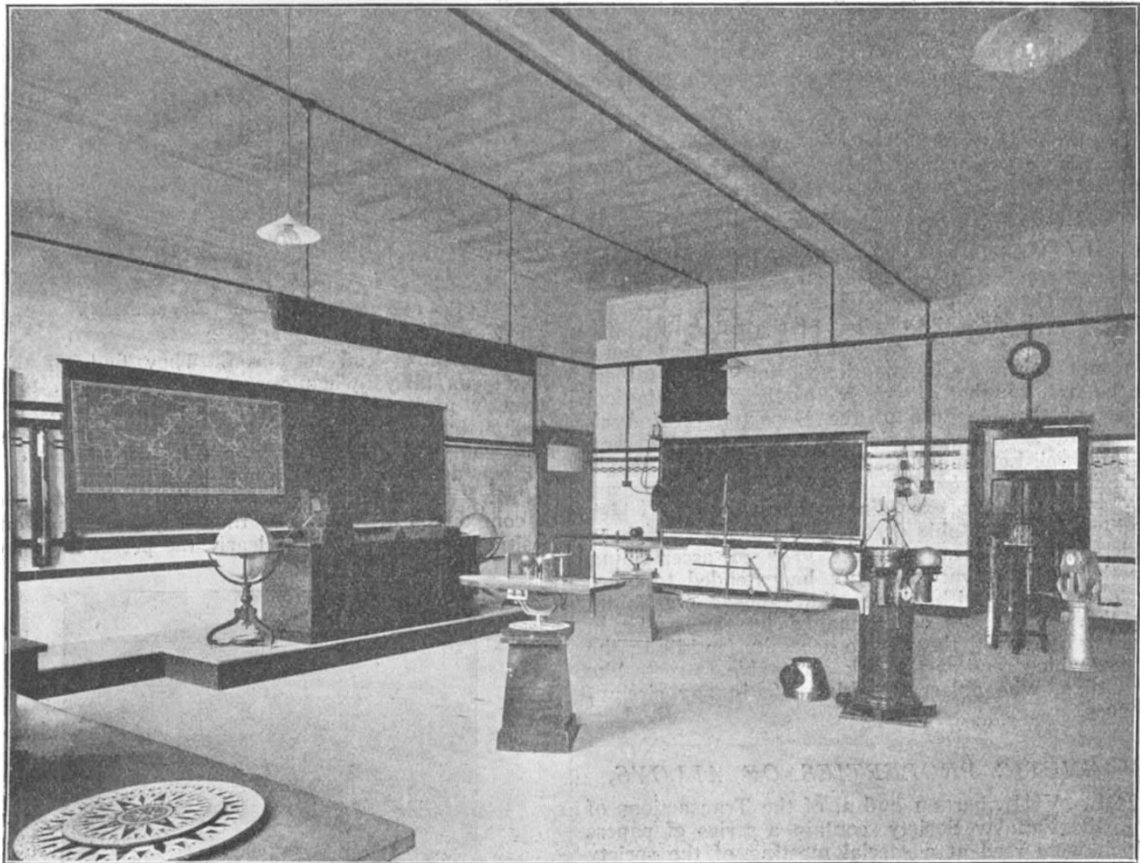


FIG. 2.—Navigation laboratory of the Royal Technical College, Glasgow.

to increased competition and the consequent necessity of saving every mile of distance and minute of time, the ingenuity of the shipbuilder, engineer, and man of science has provided the modern navigator with instruments of precision undreamt of in the earlier days of steam navigation—instruments the proper use of which demands a sound knowledge of the principles underlying their construction and a careful training in their manipulation.

The course of training has the support of the leading shipping firms, as it is recognised that the cadets who have gone through the full course will be of immediate value on board ship, instead of, as at present, wasting at least the first year of their apprenticeship picking up the elements of their profession in a haphazard fashion.

illustrations as render their identification easy. What, if any, practical results ensue from the investigation remain to be seen.

An issue of the Entomological Series of the Memoirs of the Department of Agriculture (vol. ii., No. 9), forming the second part of life-histories of Indian insects, records the results of investigations carried on at Pusa on the early stages of two species of Rhynchota and eight of Coleoptera. The memoir is illustrated with coloured plates, and, as mentioned in the preface, Mr. D. Nowrojee, to whom the investigation was entrusted, is to be congratulated on the manner in which he has carried out a difficult task.

Beautifully executed illustrations in colour are likewise a feature of a second article on insects

injuriously affecting casuarina trees in Madras, by Mr. V. S. Iyer, forming Forest Bulletin No. 11. The worst offender seems to be the caterpillar of the moth *Arbela tetraonis*, but the fat grubs of a longicorn beetle are likewise harmful.

No. 10 of the serial just quoted is devoted to an account, by Mr. R. S. Hole, of the great outbreak of bark-boring beetle-larvæ in the coniferous forests of the Simla district between 1907 and 1911. Five species were involved in this very serious attack.

From among several articles in vol. vii., part ii., of the Records of the Indian Museum, attention may be concentrated on one by Dr. N. Annandale on the Indian fresh-water soft tortoises, or mud-turtles, of the family Trionychidæ. The author recognises one species and two subspecies which were not included by Mr. Boulenger in the volume on reptiles in the "Fauna of British India," namely, Anderson's *Trionyx nigricans*, from Chittagong, which has hitherto been insufficiently described, and two local races of the widely spread *Emyda granosa*. Nor is this all, for Dr. Annandale resuscitates Gray's genus *Dogania* for *Trionyx subplana*, on the ground that in the upper shell of this species the entire series of costal plates is separated by mural bones, instead of the last pair meeting in the middle line.

In Records of the Indian Museum, vol. vii., part iii., Mr. J. R. Henderson describes a new tortoise from the Cochin district of southern India, under the name of *Geoemyda sylvatica*, *Geoemyda* being used as equivalent to *Nicoria*.

Eri or endi silk, the product of the caterpillar of a large Assamese moth, of which the technical name does not appear to be mentioned, forms the subject of the first number of vol. iv. of the Entomological Series of the Memoirs of the Department of Agriculture of India. According to the authors, Messrs. H. Maxwell-Lefroy and C. C. Ghosh, this silk, which from its nature cannot be reeled, is spun and woven in Assam into an exceedingly durable cloth, which readily takes vegetable dyes. Experiments have been undertaken at Pusa with the view of ascertaining whether the cultivation cannot be extended to other parts of India, with results that appear promising. As the cocoons are not damaged by the moths in making their exit, there is no necessity for killing the latter, which renders the silk acceptable to sects like the Jains, who object to taking life in any circumstances.

R. L.

MAGNETIC PROPERTIES OF ALLOYS.

VOL. VIII., parts 1 and 2, of the Transactions of the Faraday Society contain a series of papers which were read at a special meeting of the society held for the general discussion of the magnetic properties of alloys. The papers naturally fall into two groups, viz. those dealing with ferrous and with non-ferrous alloys respectively.

The iron-carbon and iron-silicon alloys form the subject of an exhaustive paper by Dr. Gumlich, which is of considerable importance in connection with transformer working. He finds that the presence of large amounts of silicon result in the metal, even when quickly cooled, exhibiting a pearlitic structure rather than containing the injurious solid solution of carbon in iron. With prolonged annealing even the pearlite is decomposed into ferrite and temper-carbon. A silicon content of 3 to 4 per cent. is necessary for this effect, so that the good magnetic properties of thin sheet-metal containing less than this amount of silicon must have another origin. Figs. 1 and 2 show an alloy with 4.5 per cent. silicon and 0.29 per cent. carbon. Fig. 1 is with the metal in the untreated

condition, and Fig. 2 after annealing at 975° C. The annealing has resulted in the pearlitic structure giving place to enclosures of temper-carbon, and the coercive force has been reduced from 1.26 to 0.65 C.G.S. units. A paper by Messrs. Colvert-Glauert and Hilpert, on the magnetic properties of nickel steels, describes a series of tests the results of which are at variance with the view that the peculiar magnetic properties of these alloys are due to the nickel retarding the

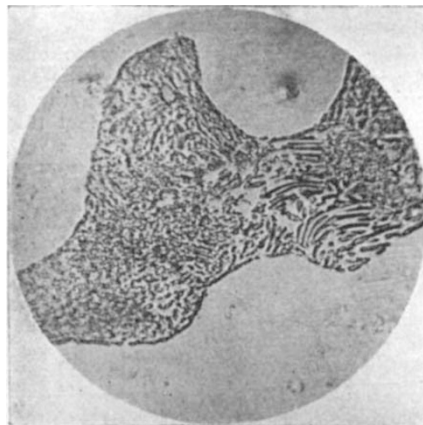


FIG. 1.—4.5 per cent. silicon-iron alloy (untreated).

change from γ -iron to α -iron. They find all their nickel-iron alloys when quenched at 1200° C. to be strongly magnetic, and they have come to the conclusion that at that high temperature a strongly magnetic compound is formed which persists through all subsequent thermal treatments.

Prof. Wedekind's paper on the magnetic properties of compounds in relation to their stoichiometric composition summarises very clearly the present state of

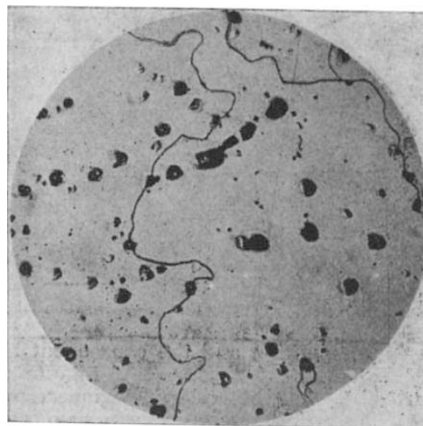


FIG. 2.—4.5 per cent. silicon-iron alloy (annealed).

knowledge on this important subject. It is found that simple compounds of ferromagnetic metals are throughout essentially more feebly magnetic than are the metals themselves, so far as they represent one particular degree of valency. Simple compounds of the latent-magnetic metals (manganese, chromium, vanadium, and (?) titanium) are generally more strongly magnetic than the metals, and some of the compounds exhibit residual magnetism. The maxi-