

carries additional information to that which may be gathered merely from the shape of the article. Crushing stone, hammering or breaking it, by heat or cold, by pressure applied in any of the many known ways, each and every item of personal work has its value, and no one can say in advance to what its inspection may lead. We gather here, if the author be correct in his claims, data which no one could have anticipated in advance of experiments.

The long-stone drill points are found unsuited to boring substances which wood and dry sand will cut with ease. Soft wood is shown to be as unsuited as is hard wood for drill shafts. The hard stone point is found to cut steatite or wood quite

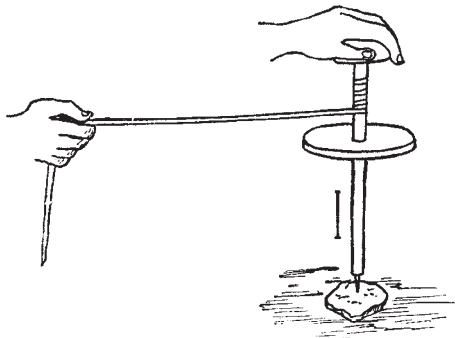


FIG. 5.—Top Drill

readily, but is easily broken if it is attempted to bore hard stone with it. The study has been a careful one, has extended over a long period, and no known source of information has been intentionally neglected. Personal acquaintance with drills and their workings, as developed in the paper, is calculated to familiarise one with the Australian or American producing fire with the plain shaft-drill. It enables us to see in a new light Ulysses and his companions boring the eye from the Cyclops king. It gives a new interpretation to one of the incarnations of Vishnu. The remark of the latter, that their foes "should share their toil," suggests further, that instead of the "Nile gods" being

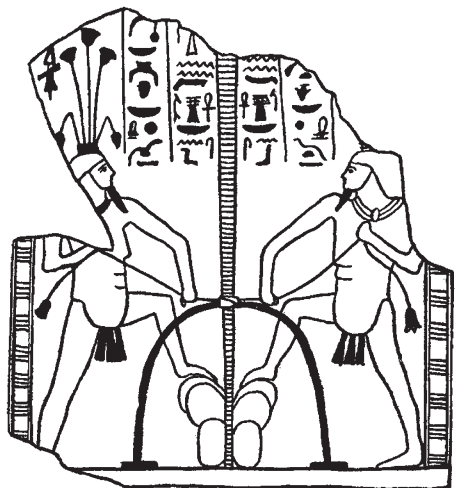


FIG. 6.—Disc Drill on Base of Statue of Amennemhat.

shown in Fig. 6, we see the citizens of a subjugated territory performing ordinary menial labour. The so-called "gods" themselves are usually females, Negro or Asiatic, who hold the straps of the drill. It will be interesting to inquire whether under the late Nubian dynasty the Negro disappears from the work, and the Egyptian takes the subordinate place when the latter became subject to the Negro dynasty. The drill represented in the closing pages of the paper is capable of performing more and better work in boring stone than any other known hand-implement, either of ancient or modern date. This drill familiarises us somewhat with the high degree of skill possessed

by the Egyptian workman of a remote antiquity. The author, in reproducing the Egyptian drill, has no doubts as to the identity of its shaft, its disc, the straps used to revolve it, or of the principle upon which it worked. He also believes that it was braced in some way. The bracing and method of tightening down the braces, invariably accompanying the drill, and even the possibility of the shafts having been tautened by strings or straps, are matters not satisfactorily interpreted. It will be a matter of interest to have more examples of this implement, which acquaints us with the man of Ancient Egypt in possession of a very complicated machine at a period in the life of the nation centuries prior to any date heretofore suggested. The scarcity of works and photographs on Egypt accessible to the author, prevents the hope that he may further interpret with available material the braces and means of tightening down this drill; but it is suggested that, in Europe and the East, there may be found sufficient data to answer this enigma.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Prof. W. J. Sollas, F.R.S., has been appointed a delegate to attend the International Geological Congress to be held at St. Petersburg in August or September next.

The following examiners for the Honour School of Natural Science have been appointed:—Physics: Mr. S. A. F. White. Chemistry: Mr. V. H. Veley, F.R.S. Physiology: Prof. F. Gotch, F.R.S. Morphology: Mr. G. C. Bourne, Mr. Adam Sedgwick, F.R.S. Botany: Mr. P. Groom, Mr. R. W. Phillips. Geology: Prof. W. J. Sollas, F.R.S., Dr. J. W. Gregory.

There are thirty-eight entries this year in Natural Science; eighteen of these are in physiology, twelve in chemistry, three in animal morphology and physics respectively, and two in geology.

The degree of Honorary M.A. has been conferred upon the Mayor of Oxford, Alderman Buckell, J.P. This is the first time that the University has conferred a degree on the Mayor of the city.

Miss Kingsley gave a public lecture at Manchester College on Friday last, on "The Connection of Fetish with West African Customary Law: a Study in Primitive Religion."

CAMBRIDGE.—The Rev. Prof. Wiltshire has presented to the Woodwardian Museum his valuable geological library, consisting of about 600 volumes and 900 pamphlets.

Prof. Macalister announces a course in Osteology, and Mr. J. E. Marr a course in Practical Geology, in the ensuing Long Vacation.

The Council of the Senate propose the re-establishment of the Professorship of Chinese, held by the late Sir Thomas F. Wade. It is understood that a distinguished Chinese scholar is willing to accept the office without stipend, and to undertake the charge of the magnificent collection of Chinese books given to the University by the late Professor. The collection is said to be unmatched in Europe, and probably in China.

The examination in Agricultural Science for the University's diploma will be held from July 5 to July 12.

The degree of LL.D. is to be conferred on Colonel Maharaj Dhiraj Sir Pratap Singh, K.C.S.I., as representing India, on June 17, when the Colonial Premiers are to receive honorary degrees.

A grant of 300*l.* from the Worts Fund has been made to Dr. A. C. Haddon, towards the expenses of an anthropological expedition to the Torres Straits. It is understood that Dr. Haddon will be accompanied by two or three other Cambridge men skilled in various branches of anthropological research, and by an expert in the Melanesian languages.

A grant of 100*l.* has also been made to Mr. H. H. W. Pearson for botanical research in Ceylon.

Dr. Humphry, Dr. Foxwell, Dr. Sidney Martin, and Dr. Mitchell Bruce have been appointed Examiners in Medicine; Dr. Phillips and Dr. Cullingworth, Examiners in Midwifery; and Mr. Pitts, Mr. Bennett, Mr. Watson-Cheyne, and Mr. Golding-Bird, Examiners in Surgery for the ensuing year.

THE London Technical Education Board has appointed Dr. J. O. W. Barratt to the scholarship in sanitary science. Dr. Barratt will commence his research work under the pathological superintendent at Claybury Asylum during the present summer.

THERE can be no doubt that some of the polytechnic institutions in London are moving towards a higher educational status than they occupied a few years ago. The courses of study are systematised, and they are supervised by teachers who have had laboratory experience; hence they educate the mind as well as train the hand. An announcement that, in the next session (1897-98) Principal Tomlinson, F.R.S., of the South-west London Polytechnic, will establish a class for training in research, affords an instance of the higher tendency of polytechnic instruction. This research training will form part of the curriculum of the second year day electrical engineering students of the institute, but will be open to a limited number of other students provided they can show a fair knowledge of the elementary principles of physics and mathematics. The method of conducting any research will be as follows:—The Principal will first select some subject for investigation suitable for electrical engineering students. He will then fully explain to the class the various reasons which have induced him to make the selection, and will give a brief history of what has been previously done round and about the subject, and full reference thereto. He will also propound a mode or modes of attacking the research, and invite criticisms from the class. When the best mode of attack has been decided on, the class will be expected not only to take part in the experiments, but to help in preparing the required apparatus. Should the results obtained be of sufficient importance, they will be offered in the form of a paper to such societies as the Royal Society, the Physical Society, or the Institution of Electrical Engineers. From time to time during the investigations the Principal will give demonstrations or lectures on those particular branches of magnetism and electricity which bear directly on the investigation, and will illustrate them by the results obtained. The subject selected for the first research is “the effect of repeated heating on the magnetic permeability and electrical conductivity of iron and steel.”

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 13.—“On the Passage of Heat between Metal Surfaces and Liquids in contact with them.” By T. E. Stanton, M.Sc. Received April 7.

An experimental investigation was undertaken to determine the rate of transmission of heat from the walls of a heated metal pipe to colder water flowing through it. By means of the apparatus constructed for this purpose the velocity, initial and final temperatures, and pressure of the water, also the surface temperature of the pipe, could be observed; and by varying the initial temperature and velocity of the water, the effect of varying ranges of temperature and velocity of water could be experimentally studied.

The results of the experiments showed that the heat transmitted from any small surface of the pipe

- (1) was independent of the pressure of the water;
- (2) was proportional to the range of temperature between the surface and the flowing water;
- (3) was approximately proportional to the velocity of the water;
- (4) was proportional to a function of the viscosity of the water; or, putting

$$H = \text{heat transmitted,} \quad S = \text{surface of pipe,}$$

$$V = \text{velocity of water,} \quad T_0 = \text{surface temperature of pipe,}$$

$$t = \text{temperature of water,}$$

$$\text{that } \frac{dH}{dS} = k \cdot (T_0 - t) V^m (1 + \alpha T_0) (1 + \beta t)$$

$$\text{where } m = \cdot 85 \quad \alpha = \cdot 004 \quad \beta = \cdot 01.$$

It is also shown that these results are in accordance with Prof. Osborne Reynolds' theory of the convection of heat from a hot surface to water flowing over it, this theory being that the motion of heat in the pipe follows the same law as the motion of momentum, as far as convection and conduction are concerned; so that, from Prof. Reynolds' equation for the fall of pressure in a pipe, the value of the slope of temperature may be expressed, the constants in which may be determined by experiment.

In this theoretical expression for the slope of temperature it is seen that the effect of the velocity of the water is very small, which is the most remarkable fact brought out by the experimental research.

“On the Magnetisation Limit of Iron.” By Henry Wilde, F.R.S. Received April 3.

In a former paper read before the Society, “On the Influence of Temperature on the Magnetisation of Iron,” the author described a new method of determining the magnetisation limit of magnetic substances, by which, with a single pole of an electro-magnet, a more exalted degree of magnetisation was indicated, as measured by the force of traction, than had previously been attained (*Roy. Soc. Proc.*, 1891, vol. 1.). The magnetisation limit of iron, as deduced from his experiments, was 381 pounds per square inch of section, and it appeared to him at the time that the extreme limit was well within 400 pounds per square inch. The author has recently had occasion to repeat these experiments with other specimens of iron of different lengths, and has increased the magnetisation limit to 422 pounds per square inch, or 29·67 kilos. per square centimetre. He describes an experiment showing that the single-pole method of determining the magnetisation limit of magnetic substances compares favourably with the double-pole method, and that no higher degree of tractive force is to be expected from the latter than has been obtained from the former method.

Linnean Society, May 6.—Dr. A. Günther, F.R.S., President, in the chair.—Prof. Ludwig Radlkofer, of Munich, was elected a Foreign Member.—Prof. Stewart, F.R.S., exhibited and made remarks on some anatomical preparations showing the different modes of attachment of the *Ligamentum nuche* in herbivorous and carnivorous mammals, as exemplified in the sheep and dog, and of the *Ligamenta subflava*. The analogous ligaments of birds were dealt with, and special attention was drawn to a preparation of the vertebral column of the python, showing *vertebra-costal fibro-cartilaginous plates* of which he could find no description and which he believed to be peculiar to the Ophidia.—The Secretary read the abstract of a paper by Messrs. W. and G. S. West, on Desmids from Singapore. These had been discovered in a small collection of Algae forwarded by Mr. H. N. Ridley from Singapore, and, in addition to seven species previously known from Sumatra, contained several which were new, and now described and figured.—Prof. Newton, F.R.S., communicated a paper by Captain F. W. Hutton, Curator of the Canterbury Museum, Christchurch, N.Z., entitled “The Problem of Utility,” in which the views of Dr. A. R. Wallace on “The Utility of Specific Characters” (*Journ. Linn. Soc. Zool.*, xxv, pp. 481-496) were criticised, chiefly as tested by the study of the fruit-pigeons (*Ptilopus*).—The Secretary gave an account of a paper by the Rev. R. Bogg Watson, on some new species of Mollusca from the Island of Madeira, prefacing his remarks with a brief *résumé* of the researches previously made in the same direction by Messrs. Lowe, Wollaston, and other conchologists.

Chemical Society, May 20.—Prof. Dewar, President, in the chair.—The following papers were read:—The theory of osmotic pressure and the hypothesis of electrolytic dissociation, by H. Crompton. It is shown that van 't Hoff's view—that the osmotic pressure of a dissolved substance in dilute solution is equal to the pressure which the substance would exercise in the same volume if gaseous—holds when the dissolved substance and the solvent form normal or monomolecular liquids, and may hold when both liquids are associated, but does not hold when one only of the two liquids is associated. When either solvent or dissolved substance is associated, van 't Hoff's formula for the molecular reduction of the freezing point requires modification; on working with the modified formula, it is found that the results obtained accord with the view that electrolytes are monomolecular compounds dissolved in an associated solvent, namely water. The hypothesis of electrolytic dissociation is thus unnecessary for explaining cases of this kind, and is further inconsistent with what is known of the molecular character of liquids. The cube of the association factor of a liquid is approximately proportional to its specific inductive capacity.—Molecular rotations of optically active salts, by H. Crompton. The fact that optically active salts of strong acids have the same equivalent rotations in dilute solution is generally quoted in support of the dissociation hypothesis; the author shows, however, that similar regularities are observed in the case of other salts which are certainly not electrolytically dissociated, so that it would seem that monomolecular salts containing a common optically active radicle have the same equivalent rotation.—Heats of neutralisation of acids and bases in dilute aqueous solution, by H. Crompton. The author explains the constancy