Rivett, and Prof. O. U. Vonwiller to advise it as to (1) the locations of the two to be retained; (2) the disposal of existing equipment; and (3) the probable initial cost, if any, of supplementing existing equipment at the two chosen observatories, the estimated cost of maintenance of these two, and the best means of disposing of outstanding work in connexion with the Astrographic Catalogue, to which work several of the States were committed many years ago. Maybe two institutions, if thoroughly well supported, will be more effective than five inadequately maintained; but many will view with misgiving a decision of this kind based mainly on a desire to save money.

Early Man in East Africa

THE conclusions at which Dr. Leakey, Dr. H. Reck, and Mr. A. T. Hopwood arrived in their recent investigation of the Oldoway Beds in relation to the antiquity of the human skeleton found in these deposits would appear to have received confirmation by a find at Kanam, a small native village on Lake Victoria. Here Dr. Leakey, it is reported in a dispatch from Nairobi which appeared in the *Times* of April 19, has discovered a lower jaw of *Homo sapiens* in deposits containing pre-Chellean implements and teeth of the same species of *Deinotherium* as was discovered at Oldoway. At Kanam, however, the beds in which the find was made correspond with the oldest of the Oldoway beds, whereas Oldoway man was found in Bed No. 2. Other finds reported from early Pleistocene deposits at Kanam are fragments of three human skulls, apparently washed out from deposits containing Chellean tools and remains of *Elephas antiquus* and *Hipparion*. At first sight, this find on Lake Victoria carries *Homo sapiens* back a stage further than the Oldoway discovery; but a more detailed account of the deposits and the conditions of the find must be awaited before a certain conclusion is possible. The difficulty of accepting a skeleton found entire, as was Oldoway man, as contemporary with the alluvial deposits in which it occurs—a difficulty already pointed out (NATURE, Feb. 27, p. 312)—is stressed in the current number of *L'Anthropologie* (t. 42, p. 214), where it is also suggested that the general conformation of the Oldoway skull points to an affinity with the modern Masai.

Liquid Carbon Dioxide in Ocean Water

IN an interesting article (*C.R. Acad. Sci. Leningrad*, 1931), the eminent Russian geochemist, V. Vernadsky, directs attention to the fact that the conditions of temperature and pressure in the depths of oceans should necessitate the existence there of carbon dioxide in a stable liquid state. The chemical interrelations of water and liquid carbon dioxide are as yet unknown, but they must play an important part in the life of organisms at great depths. Their gaseous metabolism should differ greatly from that of organisms inhabiting the surface layers of water, where the expired carbon dioxide can exist as a gas. It is known that the lower limit of plankton is about 200 metres from the surface, while sunrays penetrate very much deeper, and photo-synthesis is theoretically possible for red algæ down to 400-500 metres. They do not, however, occur below 200 metres, which means that the limit of their distribution is not governed by the lack of active light rays, but probably coincides with the zone where the gaseous state of carbon dioxide becomes unstable and the liquid state appears. Again, the conditions of gaseous metabolism of numerous organisms in the mud at the bottom of the oceans should be highly peculiar, the gases present there constituting an atmosphere very different from that in the mud of shallow waters. The interesting fact discovered more than a hundred years ago by Biot that the bladder of deep-sea fishes contains pure oxygen, which, according to later discoveries, is produced by special glands, has always remained a physiological puzzle, but it is possible that this is also connected with their life in the zone where only liquid carbon dioxide exists. It is legitimate to ask, for example, whether the oxygen in the bladder is not the result of decomposition of liquid carbon dioxide. All these considerations and examples serve to stress the necessity of organising systematic investigations on the distribution of gaseous and liquid carbon dioxide in different zones of oceans.

The Willis Navigating Machine

AT a recent meeting of the Royal Astronomical Society, the capabilities of this ingenious instrument (aviation type), designed by Mr. E. Willis for the solution of spherical triangles, were demonstrated by Dr. L. J. Comrie, Superintendent, H.M. Nautical Almanac Office. Mechanically, the instrument is a combination of an alt-azimuth and equatorial with five graduated circles corresponding to altitude, azimuth, latitude, declination, and hour angle. The principal problem in nautical astronomy is the calculation of the altitude and azimuth of a heavenly body from given values of the latitude, declination, and hour angle. These quantities are set on the corresponding circles and the machine at once gives the appropriate altitude and azimuth, which can then be used, in conjunction with the altitude from a sextant observation, to give the position line on the chart. This is only one of the many problems that the instrument can solve. In the type of instrument designed for aeronautical navigation, the circles read to five minutes of arc, which is sufficiently accurate in practice, being of the same order of accuracy as readings made with a bubble-sextant. The instrument designed for marine purposes is larger and more accurate; in this type the graduated circles read to one minute of arc. In æronautical navigation, the quick reduction of observations is an essential desideratum, and the Willis machine gives complete satisfaction in this respect. The instruments are manufactured by Messrs. Heath and Co., New Eltham, London, S.E.9.

Insulators for Switchgear and Busbars

AT present there is a great demand for insulators for high voltage outdoor isolating switchgear. With a pressure of 132,000 volts and a high mechanical stress, the greatest care has to be used in their design, as any breakdown in the continuity of supply of a

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large amount of electric power may disorganise many factories. In the usual design of high pressure insulators, cement is used inside the porcelain to join the shells and the metal parts together. Any expansion of the cement imposes bursting stresses on the porcelain, which often cracks. Some manufacturers, with this danger in view, sacrifice some of the mechanical strength of the joint by inserting elastic layers of bitumastic paint and, in addition, dilute the cement with sand to reduce the percentage expansion. Continental engineers have recently been using insulators in which internal cement layers have been entirely eliminated. They consist of porcelain cylinders carrying suitable projections called rain-sheds and containing no cement layers. The elasticity of the flanges takes up the expansion of the cement. This cylindrical construction has been developed in Great Britain by Messrs. Steatite and Porcelain Products, Ltd., who export them abroad. They now supply 132 kv. cylindrical type switchgear insulators for the substations of the latest section of the British grid. The disadvantage of the wide base customary with this type of insulator has been overcome by the introduction of an ingenious series of flanged castings, so made that all the standard methods of fixing now in use can be applied to the cylindrical insulators. They are so designed that the greatest possible amount of surface is exposed to natural cleaning. The use of these new insulators on the grid will, during the next few years, give an opportunity of comparing them with the older type under working conditions. Their increasing use on lower voltages should help towards the electrician's ideal of complete continuity of service.

Boiler Plant in Power Stations

To the electrical engineer a knowledge of the thermal efficiency, operating costs, and trustworthiness of the boiler plant in his power station is almost as important as a knowledge of his electrical machines. J. Bruce read a lengthy paper on this subject on March 10 to the Institution of Electrical Engineers. He had, however, to omit the discussion of flue gas, dust, and sulphurous fume extraction, as the Chimney Emissions Committee has not yet reported. He pointed out that a study of present-day American conditions leads to the general conclusion that the best American generating stations have a higher thermal efficiency than those representative of the best average British practice. A number of American generating stations produce a kilowatt hour for a heat expenditure of less than 14,000 B.Th.U. This is due to better boiler plant and to the higher grade of employee used in operating it. The Detroit Edison Company, for example, has a boiler-house efficiency of 87 per cent. In the United States, when a station uses high steam pressure, it either uses a pressure of about 600 lb. per square inch or one of about 1300 lb. per square inch. At the present time, there are 15 boiler units operating successfully and with no serious troubles in the neighbourhood of the higher pressure. Large boiler units capable of evaporating one million pounds of water per hour are being successfully operated. The capital cost of the boiler plant required increases rapidly with the pressure when it is above 600 lb. per square inch. Consequently, when coal is cheap the interest on the increased capital cost may more than offset the gain in the heat efficiency. America has the advantage over Great Britain that combustion equipment can be developed for a particular quality of coal owing to the geological characteristics of the coal being uniform over wide areas. British practice, although not obtaining such excellent thermal results, has yet made good progress of recent years.

Manufacture of Electric Lamps

ONE of the exhibits at the Faraday Centenary Exhibition last September which attracted much attention was that showing some of the operations in the manufacture of electric lamps. Only a few of the operations could be demonstrated, but much further information on the subject is contained in an article on "The Mass Production of Electric Incandescent Lamps" in *Engineering* for March 25. The article contains a description of the new Wembley Lamp Factory of the General Electric Co., Ltd., which has a capacity of 25,000,000 lamps a year. All the machines used are illustrated, and many interesting facts are given about the manufacture of the components of a lamp. The tungsten for the filament is obtained from the ore scheelite. It is first prepared in the form of powder, which is subjected to very great pressure and then treated in an atmosphere of hydrogen, first at about 1200° C., and then at about 3000° C. Sixty drawings are required to reduce the original 1 mm. rod to a filament 0·015 mm. in diameter, and a tungsten bar $\frac{1}{4}$ in. square and 10 in. long can be drawn into 15 miles of filament. The leading-in wires, which used to be of platinum, are now of copper-covered nickel-steel. The important operation of exhausting the lamps and then filling them with gas is done on capstan machines, each holding twenty-four lamps. Vacuum pumps reduce the pressure in them to a few thousandths of a millimetre of mercury, heat from an oven drives off moisture and adsorbed gas, and, while still hot, the lamps are filled with a mixture of nitrogen and argon, the internal pressure when cold being about two-thirds of an atmosphere.

The World's Natural History Societies

THE diffusion of scientific interests in the world, as indicated by the numbers and distribution of natural history societies, has been studied by Enrique Sparn (*Bol. Acad. Nac. Ciénc. Buenos Aires*, vol. 31, p. 171; 1931). Confining the inquiry to the larger societies, with a membership of 500 or more, the author finds that the world total amounts to 116 societies, of which 52 are devoted to natural history in general, 34 to zoology, 14 to botany, and 16 to geology. From a geographical point of view, natural history interests would appear to be tolerably restricted, for when we have mentioned 83 European societies with a total membership of 132,182 individuals, and 30 American societies with a membership of 160,947, there remain only 2 societies in Asia with a membership of 1938,

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