where N, P, e and n stand for neutron, proton, electron and neutrino. The electron e^{II} may further undergo a Jordan transformation depending on its energy in the field of the nucleus. The number of electrons with less than half the transition energy of the nucleus would be greater than that of those with energy greater than half the transition energy as there would be the tendency for the higher energy electron to undergo the Jordan transformation, thus resulting in an asymmetrical curve representing the number of electrons with a given energy.

N. S. NAGENDRA NATH.

Andhra University,
Waltair.
July 11.

An Inexpensive Low-Temperature Thermostat

SINCE the low-temperature thermostats on the market involving an electric refrigerator and temperature regulator are very expensive, it is possible that the following easily constructed apparatus (Fig. 1) may prove of value to many research workers. It was designed for the purpose of subjecting small aquatic animals to a constant temperature over a range of 4°–10° C. Our present apparatus will maintain a constant temperature $\pm$ 0·1° C. Working at 5° C. it will consume approximately ½ cwt. of ice in 100 hours.

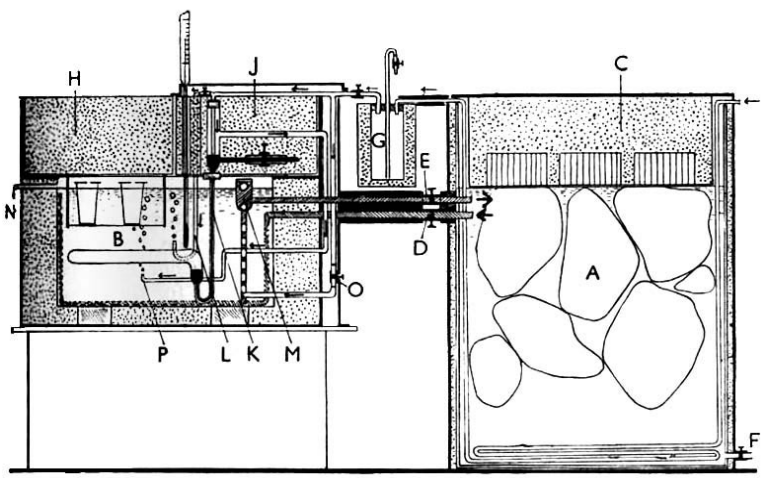


Fig. 1.

It consists of two tanks, A a large reservoir containing ice and water, and a small thermostat bath B, both of which are well insulated with powdered cork. A constant temperature in the bath B is maintained by a controlled circulation of water between it and the ice tank through the insulated tubes D and E. This flow is induced by a stream of air bubbles entering via O and streaming up the tube into the cup M, thus raising the level of the water in the latter and causing a flow via E into the ice tank. This is compensated by a back flow of cold water into the bath through D. The air is first cooled by passage through a coil at the bottom of the ice tank in order to prevent subsequent condensation in the thermo-regulator. Any water condensed in the coil is forced up and retained in the trap G. The air can then pass (1) through O to the circulator already described; (2) via the toluol-mercury gas regulator K to the bubbler P; or (3) direct to the bubbler L. When the bath temperature falls lower than that required, the air passage through the regulator is open and the tube diameters and taps are so adjusted that all the air is passing into the bath through the bubbler P, thus keeping the water stirred. When the temperature rises as a result of inevitable heat leakage from the air, the bubbler P is stopped by the rise of the mercury in the regulator and the air passes through the circulator and the bubbler L. The result is that the bath temperature is lowered by inflow of cold water while stirring is still maintained. The well-insulated lid of the thermostat bath is in two halves, one, J, into which are inset the thermometer, thermo-regulator and connexions, and the other, H, which is removable in order to give access to the experimental vessels resting on a wire tray. The lid C of the ice tank is weighted and so arranged that it touches the surface of the water at the required level. This prevents alteration in level due to melting of floating ice; that due to specific gravity changes is not sufficient to affect the apparatus and is readjusted when the ice is renewed. Preparatory to addition of more ice, the tubes D and E must be shut while the water is run off through F. An overflow N from the thermostat bath must be provided.

It is, of course, essential that the insulation should be protected against damp from the air or from possible leakage over the edges of the tanks, and that the tube connexions are thoroughly firm and watertight. There is no doubt that the efficiency and sensitivity of our present apparatus could be increased by improvement of certain details, particularly in insulation and in the form of the thermo-regulator. In the absence of a compressed air supply, we have found a Grafton electric aquarium aerator to be thoroughly satisfactory.

The apparatus could be used as a cold aquarium for larger animals if the bath B were made of glass or porcelain and the water circulated between this and a vessel suspended in A and surrounded by the ice and water. It might also be adapted for use at temperatures below 0° C. if brine were used, cooling being done by the suspension of a vessel in A containing a block of solid carbon dioxide.

L. C. BEADLE.
F. A. BOOTH.

University of Durham College of Medicine,
Newcastle-upon-Tyne.

Production of Thin Gold Films

IN view of the interest attached to the investigation of the physical properties of thin metallic films, a new and easy method for producing such films of pure gold would seem to have special significance.

Certain organo-gold compounds or their derivatives and, particularly the simplest of such compounds, namely, diethylmonobromogold[1], $[Au(C_2H_5)_2Br]_2$, when dissolved in a suitable solvent such as ethanol to which alkali is added, undergo an interesting

decomposition even at the ordinary temperature; the solutions become deeply coloured like those of colloidal gold and in a short time (seven to nine minutes at the ordinary temperatures) gold is deposited as a coherent film.

Brilliant films have been deposited on suitably prepared glass and other surfaces. By reflected light they appear as massive gold and by transmitted light they show the characteristic colours of thin gold films. The films are capable of being polished, but they can be produced in such a manner as to render this unnecessary. The thickness of the films can be varied by altering the conditions of the reaction and the quantities of the reactants.

The necessary starting material being available, the pure gold films are actually more easily produced than those of silver and are much more chemically inert. In spite of their opulent appearance as mirrors, the films of pure gold produced so readily and deposited on glass, etc., may have considerable scientific application.

CHARLES S. GIBSON.

Chemistry Department,
Guy's Hospital Medical School,
London, S.E.1.
July 21.

[1] Gibson and co-workers, *J. Chem. Soc.*, 2531 (1930); 2407 (1931): 860 (1934); 1024 (1935); 324 (1936). Gibson, Provisional Patent Specification, 17261/1937.

Spontaneous Electrical Charge of Fine Coal Dust

IN the last paragraph of their letter on "Some New Characteristic Properties of Certain Industrial Dusts" in NATURE of May 1, Prof. H. V. A. Briscoe and colleagues state: "On several occasions we have found that fine dusts which have become aggregated by settlement or have been for some time exposed to air appear to be much less reactive than when freshly formed. . . ." In this connexion I have obtained interesting evidence which has specific reference to the varying liability of fine dusts to spontaneous electrical charging also dependent upon pre-treatment.

Two samples of the same coal dust were respectively maintained at 80° C. in an oven for 24 hours and 36 hours, the latter being periodically stirred and turned. Representative results of the voltages generated on circulating these dusts were:

	Voltage of generated charge at same capacity	Weight
24-hour sample	344·0	3 gm.
,, ,,	747·5	5 gm.
36-hour sample	270·0	3 gm.
,, ,,	589·0	5 gm.

The ratio of charge generation is approximately 1·25 : 1 for 24 hour to 36 hour samples.

The residue of the 24-hour sample was then retained in the desiccator at N.T.P., whilst the 36-hour sample residue was further heated in the oven, and the charge divergences were confirmed as follows:

	Voltage of generated charge at same capacity	Weight
Desiccator sample	234·0	2 gm.
Oven sample	64·5	2 gm.

Fresh samples of the same coal dust were then used, and after varying treatments of sub-divided samples (2 gm. each), were found to generate charge as follows:

Treatment	Voltage of generated charge at same capacity
1. In desiccator overnight	256·9
2. In oven 1 hour	205·4
3. No. 2, after 2½ hours in desiccator	240·8
4. Several days in oven	112·0
5. As No. 4, but turned over many times	87·8

The continuing loss of electrical activity with age of dust is shown.

From 1 and 2, drying with heat produces a lower charge than drying at normal temperature, hence charge variation is probably due to a heating effect, for example, either oxidation or gaseous adsorption on particle surfaces, or both. From 2 and 3, as the regeneration of activity on cooling in desiccator is not likely to be due to reversal of oxidation, it is likely to be due to gas re-adsorbed on cooling in desiccator to replace gas driven off by heating in oven. From 3, 4 and 5, as heating and agitation continue, electrical charge progressively decreases. The decrease, therefore, is probably due to continuing de-adsorption.

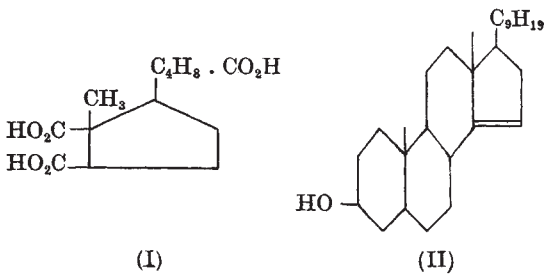
It seems, therefore, that the tendency to spontaneous electrical activity of a coal dust decreases with age of dust and with probable decrease of adsorbed films or molecules on the dust particles, and increases, despite age, with increase of such adsorption.

S. C. BLACKTIN.

20 Denton Avenue,
Leeds, 8.
June 10.

Stereochemistry of the Sterols and the Bile Acids

ALTHOUGH the stereochemistry of the *A* and *B* rings of the sterols and allied substances has been very fully developed, the evidence for the stereochemical configurations of the other rings rests on less secure grounds. The evidence for the *trans* fusion of the *B* and *C* rings rests solely on the requirements of a flat molecule as adduced from X-ray data, while that for the *trans* fusion of rings *C* and *D* is based on



(I) (II)

the isolation of the tricarboxylic acid (I) by the stepwise degradation of 12-ketocholanic acid[1] and desoxycholic acid[2]. This acid on pyrolysis gave an anhydride which on hydrolysis furnished an isomeric tricarboxylic acid. It was, therefore, deduced that the former acid had a *trans* configuration, from which it was assumed that the fusion of rings *C* and *D* was originally in the *trans* position. This conclusion would seem to be sound provided that no inversion occurred in the degradation, a loop-hole which cannot be excluded.

Recent work on the relative stabilities of *cis* and *trans* hydrindane derivatives leads to a different