

Materials for cleaning buildings have been under review, and a number of proprietary preparations investigated. It is pointed out that it is inadvisable to use chemical methods, and that alkalis are equally as dangerous as acids. Examples of the deleterious effects of cleaning in stone walls, door jambs, etc., are quoted.

Work on the effect of firing conditions on the properties of bricks has shown that specimens fired to below 900° C. offered only a moderate resistance to disruption by the crystallization of soluble salts whereas, with one exception, all the clays tested proved satisfactory in this respect when fired to 1,000° C. The unsightly efflorescence on brickwork is caused by soluble magnesium compounds, particularly

the sulphate, contained in the bricks, and the only certain method of its elimination is firing to a temperature of above 1,050° C.

The report also contains particulars of tests made on the heating, cooling and lighting of buildings. The notable difference in the temperatures inside a wooden shed, before and after whitening it, is shown in the results of one inquiry, while the diminution of the lighting of a room due to a balcony or neighbouring building is the subject of another. Particulars of the work carried out in conjunction with other bodies and on behalf of manufacturers, indicate the value of the scientific services rendered by the Building Research Board both to the industry and to the interests of the public.

The Machinery of the *Queen Mary*

THE ninth Thomas Lowe Gray lecture was delivered before the Institution of Mechanical Engineers on January 8 by Mr. John Austin, superintendent engineer, Cunard White Star, Ltd., and took the form of a description of the main and auxiliary machinery of the *Queen Mary*.

Mr. Austin pointed out that since the advent of steam propulsion, the trend of development in the design of Atlantic liners has been towards larger and faster ships, and the several commercial and technical considerations which determined the size and speed of the new vessel were explained. Before a decision was taken as to the type of machinery to be installed, a committee of eminent engineers was invited to advise the directors, and they unanimously recommended high-pressure water-tube boilers with superheaters and air-preheaters and, for propulsion, single reduction geared turbines as being most suitable by reason of their reliability, simplicity, lightness, efficiency and freedom from noise and vibration. To meet emergencies and to maintain the fortnightly schedule, a large reserve of steaming capacity was provided and, in relation to the normal power required, it is of particular interest to the engineer to note how much design of hull and propellers has improved. From the table of figures given, the *Lucania* of 1893 had a gross tonnage of 12,952, horse-power 27,650 and speed 21.9 knots. The *Queen Mary* has 6.2 times the tonnage, but only 5.7 times the horse-power, although her speed is 1.2 times that of the *Lucania*.

The arrangements to ensure economy and to obviate delays and damage are as complete as human ingenuity can make them. Salt-water detectors are fitted at every point where salt-water might leak into the feed-water system, and give audible and visible warning when the concentration reaches 2 grains per gallon. Automatic feed-water regulators ensure a steady water-level in the boilers. The adoption of the closed stokehold system of forced draught has obviated the need for massive air ducts, and maintains better ventilation and working conditions. Each boiler has a complete system of steam soot blowers, and the arrangement by which boilers and propelling machinery have been divided into two quite independent systems—only practicable in a ship of such large size and power—ensures that, in the event of breakdown in one section, the whole propelling machinery is not put out of action.

The steering and manoeuvring of a ship of this size necessitates a rudder of large area and, this being of streamline unbalanced type, powerful operating gear had to be installed. The torque is supplied by four hydraulic rams acting on tillers projecting from the rudder-stock. For safety, the essential parts were duplicated and the pumps are driven by three electric motors each of 250 h.p., the switchboard of which is operated by servo gear of the electro-hydraulic type controlled by hydraulic telemotors working in conjunction with the steering wheel on the bridge.

Crystalline Structure of Cellulose

PROF. K. H. MEYER reviews in the February issue of the *Berichte der deutschen chemischen Gesellschaft* the evidence upon which the structure of the crystalline part of cellulose has been based, and suggests that certain alterations are needed in the accepted model which was constructed from X-ray intensity measurements carried out by Andress in 1929.

Fortunately, the existing calculations upon the dimensions of the micelles or crystallites remain for the most part undisturbed, since the latter are

independent units and the cellulose type of linkage is not challenged. But the grouping of the micelles needs reconsideration. Hitherto it has been assumed that they all run in the same direction.

There seems to be no valid proof that this is the case, and the fact that precipitated hydratecellulose possesses the same crystal lattice as that of the mercerized fibre makes it highly improbable that all the chains are similarly orientated. There is, in fact, no reason why an equal number of chains should not be formed in opposite directions by precipitation.

Moreover, the minor alterations in dimensions, which have resulted from new X-ray intensity measurements, show that the suggested new model, in which the crystallites are arranged to run alternately in opposite directions, is more in accordance with measurements than the older one. In particular, there is no longer any need for deviations from the tetrahedral angle in the side-chains, and the recalculated distance of 2.6 Å. between hydroxyl groups of neighbouring chains, agrees well with the recent measurements by Bernal on hydroxyl distances.

It is known that a small amount of oxidation occurs in native cellulose and it is suggested that the resulting acid groups may esterify with neighbouring micelles. This may account for the resistance to methylation observed by Karrer to the extent of about 8 per cent of the hydroxyl groups. No information could be derived about the ends of the chains, but it is pointed out that in the new model the terminal aldehyde groups might lose their identity by forming glucosidic links with the terminal alcoholic groups of the other micelles to form giant rings.

Birmingham Conference on Industrial Physics

THE rapid development of industrial applications of physics to industry in recent years has brought with it the desire for opportunities for the interchange of ideas and for the discussion of the many and varied topics which have consequently arisen. The more enterprising industrialist also desires opportunities of learning of these latest developments in order to keep himself abreast of his competitors, especially those abroad. The Institute of Physics is endeavouring to meet this demand by founding branches both at home and overseas, and by holding periodic conferences on industrial physics. The first Industrial Physics Conference to be held took place in Manchester in 1935 (see NATURE, April 6, 1935, p. 555) and the second was held in Birmingham on March 8-20, the subject being "Optical Devices in Research and Industry".

The sessions were held in the University of Birmingham. The Conference was formerly opened by Mr. Walter Barrow, pro-chancellor of the University, and was presided over by the president of the Institute, Prof. A. Fowler. Following the established practice of the Institute, the lectures were all informal in character and were followed by discussions. Neither the lectures nor the subsequent discussions will be published, except the presidential address, which will appear in an early number of the *Journal of Scientific Instruments*; the title of this address was "Spectroscopy in Industry". The other lectures were: "Colorimetry, Spectrophotometry and the Inspection of Manufactured Products for 'Appearance'", by Mr. R. Donaldson, of the National Physical Laboratory; "The Application of Electron Diffraction to Industrial Problems" by Prof. G. I. Finch, of the Imperial College of Science and Technology; "Industrial Uses of Photocells" by Mr. A. L. Whiteley, of the British Thomson-Houston Co., Ltd.; "Optical Gauges for Metrology and Engineering" by Mr. F. H. Rolt, of the National Physical Laboratory; "Polarimeters, Saccharimeters and Refractometers in Sugar, Jam-boiling and other Industries", by Mr. L. Eynon, of Messrs. Eynon and Lane, official analysts to the Sugar Association of London. The attendance at each of the lectures was excellent, averaging 325. Both the lecturers and those who took part in the subsequent lively discussions dealt with recent industrial applications of the various optical and allied devices and the associated problems, rather than with the technical details and underlying principles of the devices themselves.

On March 20 parties of Conference members were

able to see the direct application of physics to industry in the Longbridge Works of the Austin Motor Co., Ltd., the engineering works of the General Electric Co., Ltd., and the Research and Development Department of the Mond Nickel Co., Ltd., as well as the associated works of Messrs. Henry Wiggin and Co., Ltd.

Twenty-three firms and research organizations were represented at an Exhibition of apparatus, instruments and books cognate to the subject of the Conference, which was held in the physics laboratories of the University. The Government's recognition of the importance of physics to industry was demonstrated by several exhibits contributed by the National Physical Laboratory and the Post Office Engineering Research Station. A special section of the exhibition was devoted to optical experiments of general interest, including many ingenious applications of photocells. The object of the whole Exhibition was to demonstrate the existence of apparatus and instruments designed on well-known physical principles for use in the workshop and factory. It was agreed, even by those familiar with the subject, that the wide range covered by the devices shown was considerably more extensive than is generally appreciated. Many instances were recorded in which responsible executives were enabled by this Conference and Exhibition to learn of the existence of devices which should prove of the utmost value in their factories. A limited number of copies of the catalogue of the Exhibition is still available from the Institute of Physics, London, S.W.7 (9d. post paid). The educational value of the Exhibition was appreciated by the local schools, and it was visited by parties of senior scholars from them. It is estimated that about 2,500 people visited the Exhibition during the three days that it was open.

Prof. J. A. Crowther, honorary secretary of the Institute, broadcast a talk about the Conference and Exhibition on the eve of its opening, and it also received extensive attention from both the lay and technical press. There was thus further confirmation of the fact that there exists a great demand for information about recent scientific discoveries and particularly their application to industrial and domestic problems.

No report of the Conference would be complete without recording the valuable contacts which resulted from bringing together physicists and industrialists, and the great help rendered by the authorities and members of the staff of the University of Birmingham.

HERBERT R. LANG.