Seventh International Congress of Refrigeration

By Dr. Ezer Griffiths, F.R.S.

THE Seventh International Congress of Refrigeration, organized by L'Institut International du Froid and the Netherlands Association of Refrigeration, opened at The Hague on June 16 and closed at Amsterdam on June 20. For the opening ceremony, about four hundred members of the Congress, including delegates of fifty nations and members of the Dutch Government, assembled at the historic Ridderzaal—the Hall of the Knights at The Hague. At this meeting, speeches of welcome were made by representatives of the Dutch Government and such preliminaries settled as the appointment of presidents and secretaries of sections, together with the procedure to be followed in the conduct of the meetings.

The work of the Congress was subdivided between four sections, and altogether about two hundred papers and reports came under consideration. Abstracts of the papers were printed in the language supplied, followed by translations in French and (or) English. The topics of these papers covered the whole field of low temperature work, and were of a varied character, ranging from paramagnetism to a new method of making ice rinks. The mass of material to be dealt with proved embarrassing, since in the limited time available full discussion was impossible.

There was a feeling that a more rigid process of selection would need to be followed in preparing the programme of the next Congress. In a congress of this character, adequate time for discussion is all-important, for sometimes ancillary information of considerable interest is brought out in the course of a discussion. For example, a paper was read describing the development of refrigeration in Japan ; and, in answer to a question, an outline was given of the method employed in certain parts of that country for the cultivation of strawberries—a subject of general interest. A sunny slope is selected exposed to sea-breezes. The rocks are arranged with pockets of earth between, and in these the roots of the strawberry plant are planted. At night the rocks cool and condense water vapour which trickles down the rocks and is absorbed by the earth. By day the rocks warm up rapidly and afford a source of heat to the strawberry plant.

The majority of the papers dealt with that aspect of low temperature work which is concerned with methods for the preservation of perishable foodstuffs. The papers read at this Congress would perhaps suggest that the engineer is greatly in advance of the biologist in the science of refrigeration, but this impression is probably due to the fact that biological workers as a whole failed to support the Congress to the same degree as their engineering colleagues. Much of the biological work recorded was more of a descriptive character than an attempt to get down to fundamentals as regards the chemical and structural changes taking place consequent on storage temperature and environments. There is great scope for investigation on the biological side, particularly in respect of tropical fruits, and it may be of interest to record that a resolution was passed at this Congress recommending that the question of tropical fruits should occupy a prominent place in the programme of the next Congress ; such fruits afford interesting material for research, for it is possible to carry out, in the course of weeks, experiments which may be protracted over many months in the case of hard fruits.

Reverting to the engineering side, it was noteworthy from the papers submitted to the Congress that advances are being made in the production of temperatures considerably lower than those customary in cold-stores work, although of course much higher than liquid air temperatures. Here the question is not one of the mere attainment of low temperatures, but the economical production of temperatures of the order of $-50°$ C. in large spaces. For example, ice-cream manufacturers prefer quick hardening of their product in wind tunnels at $-40°$ to $-50°$ C. to slow hardening at a higher temperature.

These developments in refrigeration have resulted in the evolution of special types of refrigerating machinery. For intermediate temperatures of, say, $-25°$ to $-40°$ C. the booster compressor of the rotary blower or piston type finds application in raising the pressure of low density vapour to densities at which it can be efficiently handled by compressors of standard design. Lower temperatures are obtainable by refrigerating equipment of the modern absorption type, in which temperatures so low as $-76°$ C. can be economically obtained in commercial practice, using ammonia, in spite of that temperature being within one degree of the triple point of ammonia and the specific volume being twenty-five to thirty times as great as at ice-making temperatures.

The question may reasonably be asked what useful purpose does such a Congress serve. In the first place, it affords unique opportunity for workers in various countries to establish contact

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and exchange views, and on this occasion the various nationalities came together with a common objective. Representatives from the Dominions Overseas appreciated to the full the value of the Congress as an opportunity to meet their colleagues. The Congress also demonstrated to those countries which are lagging behind in the encouragement of scientific work the benefits accruing from organized research.

During the period of the Congress, meetings of some of the commissions functioning under the auspices of the Institut International du Froid were convened. Commission No. 1 considered the question of temperature measurements down to liquid hydrogen temperatures. The temperature scale is defined by international agreement down to the boiling point of oxygen; beyond this there is no generally accepted standard scale. Even in the range covered by the International Scale, further work appears to be necessary, since some investigators have found that platinum thermometers constructed and calibrated according to specification differ by so much as 0·03° at about 140° C. To study this question, it was decided to set up a committee composed of representatives of the various national laboratories and of those centres where low temperature investigations are in progress.

Commission No. 12 on land transport and Commission No. 13 on water transport held a joint session. As problems for further study, they decided that data should be collected as to the heat production of various types of fruit, this being a matter of interest to the marine engineer when dealing with fruit delivered to the ship without pre-cooling. It was also decided to consider methods for the control of the atmospheric conditions in the holds of ships carrying perishable produce requiring atmospheres of high carbon dioxide and low oxygen content.

These are subjects which will be studied by expert committees under the auspices of the Institut International du Froid and reported upon at the next Congress.

Thanks to the thorough planning of the executive committee, the arrangements worked smoothly and efficiently, and those participating will retain the most pleasant memories of a very useful meeting.

The Royal Research Ship *Research*

By Dr. H. Spencer Jones, F.R.S., Astronomer Royal

THE destruction of the non-magnetic ship *Carnegie* by an explosion, at Apia, Western Samoa, on November 29, 1929, brought to a sudden end the magnetic survey of the oceanic areas, which had been carried on for twenty-five years by the Carnegie Institution of Washington. The *Carnegie* had been specially designed and constructed for obtaining magnetic observations at sea. She was a hermaphrodite brig, built of white oak and pine, with copper or bronze fastenings, and with a displacement of 568 tons. She was equipped with an auxiliary engine, capable of giving a speed of about 6 knots in calm weather; the engine was of internal combustion type and, at first, used gas generated from solid fuel, but, as this proved not altogether satisfactory, petrol was substituted. Sufficient fuel was carried to give a cruising range of 2,000 miles at 6 knots. With the exception of cast-iron pistons for the cylinders of the engine and the steel cams necessary for operating the valves, amounting in all to less than 600 lb., no magnetic material was used in the construction of the ship.

In six cruises between 1909 and 1921, the *Carnegie* traversed 252,702 miles in 3,267 days actually at sea. Her last cruise was planned to extend from May 1928 to September 1931 and to cover 110,000 miles. It was designed to determine the secular change of the earth's magnetism in all oceans, by making numerous intersections with the tracks of previous cruises. Nearly one half of this cruise had been completed at the time of her loss.

The results obtained by the *Carnegie* were placed freely and promptly by the Carnegie Institution at the disposal of the British and other Governments, for use in the construction of world magnetic charts. Successive issues of these charts were based to an increasing extent upon the data provided by the *Carnegie*.

The secular changes of the magnetic elements at any given place are not constant quantities. Extrapolation over long periods may therefore lead to considerable errors. The continual accumulation of observations is necessary in order to determine both the secular change and the rate of change of the secular change of each element. At the present time, the magnetic data are most uncertain in the Indian Ocean. The last cruise of the *Carnegie* in the Indian Ocean was in the year 1919. The

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