of the country will be sent to the officers of the Council, Edward B. Mathews, chairman, National Research Council, or A. G. Seiler, secretary, Touring Bureau, A. A. A., Riggs Building, Washington, D. C.

The annual meeting of the Society for Extending Rothamsted Experiments was held on June 18 at Rothamsted, Harpenden. Mr. J. F. Mason presided. It was reported by Dr. E. J. Russell, director, that the work of the station had again become normal. The staff was now complete, and operations active in all departments. The staff of the station at present numbers 70, and there are large laboratories and a 300-acre farm. The Ministry of Agriculture has now asked that the station shall undertake the study of the diseases of plants, and although the work has been begun the present facilities are quite inadequate. It is proposed to buy an adjoining site to build there a special laboratory for this work. For this £4,000 is needed, and half will be provided by the government. The remainder has to be found privately, and a fourth of the amount has already been subscribed.

According to an Associated Press despatch an expedition fitted out by the Swedish Society of Anthropology and Geography of Stockholm has left Yokahama to make a scientific survey of the peninsula of Kamchatka. The work will last for at least two years. The members of the expedition are from the University of Stockholm and are under the direction of Even Bergman. They are prepared for a zoological, botanical ethnographical, geological and geographical survey of the whole peninsula. The collections will be donated to the Swedish Geographical Society and to the University of Stockholm. Kamchatka is known to have a rich and varied flora and fauna, but it is comparatively unknown to scientists. The plant life is particularly interesting, as it is unusually extensive for the high latitude, and many of the forms belong to regions much farther south. Birds and animals are numerous, and as far as known are similar to those of Alaska.

UNIVERSITY AND EDUCATIONAL NEWS

The Harvard University School of Medicine has received $350,000 from the Rockefeller Foundation for the development of psychiatry, and $300,000 for the development of obstetric teaching.

Mr. M. Douglas Flattery, an American, has presented the Institute of Bacteriology at Lyons with 100,000 francs for an annual scholarship for a student who will specialize in laboratory work on the bacteriology of infectious diseases.

At the University of Minnesota Dr. W. H. Hunter has been appointed professor of chemistry and acting head of the division of organic chemistry; Dr. C. A. Mann, professor of industrial chemistry and acting head of the division of industrial chemistry; Dr. G. H. Montillon, associate professor of industrial chemistry, and Dr. R. E. Kirk, of Iowa State College, assistant professor in general chemistry.

Dr. Daniel Starch, of the University of Wisconsin, has become associate professor of psychology in the school of business administration at Harvard University.

Professor James Newton Michie, assistant professor of mathematics in the Agricultural and Mechanical College of Texas, has been appointed adjunct professor in the department of applied mathematics at the University of Texas.

P. W. Boutwell, assistant professor of agricultural chemistry at the University of Wisconsin, has been appointed associate professor of chemistry at Beloit College.

W. J. Fuller, assistant professor of civil and structural engineering of the University of Wisconsin Extension Division, has recently resigned to accept a position on the engineering staff of the Government Institute of Technology at Shanghai, China.

The *Bulletin* of the American Mathematical Society states that at the University of Berlin, Professor L. E. Brouwer, of the Univer-

sity of Amsterdam, has been appointed professor of mathematics; Professor R. von Mises, of the Dresden technical school, has been appointed professor of applied mathematics, and Dr. Issai Schur has been promoted to a full professorship of mathematics. Professor C. Carathéodory has resigned, to accept a professorship at the National University of Athens.

DISCUSSION AND CORRESPONDENCE

EFFICIENCY IN THERMAL CALCULATIONS

THERE is something wrong with the commonly accepted definitions used in calculating efficiency when applied to thermal phenomena.

Take the following case as an example. An ice-making machine is placed in a room that requires heating. Let us calculate the efficiency of the operation of heating the room. Assuming the machine to be operated by an electric motor, the heat supplied to the room consists of two parts, the heat equivalent of the electric current, and the heat withdrawn from the water in making ice. As the entire machine is located in the room, there are no losses, all friction being utilized as useful heat. We therefore have a case where the useful heat is greater than the heat we paid for, or an efficiency of over 100 per cent.

For another illustration, consider the heating of a room by an electric heater. The efficiency is 100 per cent., as all the energy of the current goes into the room. But this same current could have been used to run machinery in the room, such as fans, sewing machines, etc., that would have returned all the heat to the room eventually. Should not this additional work be considered in calculating the efficiency of the outfit?

There is one long established law that gives the clue to more suitable definitions of thermal heat units. Carnot established the fact that the efficiency of an ideal heat engine was equal to $(T_1 - T_2)/T_1$ where T_1 equals the absolute temperature of the source of heat and T_2 the temperature of the exhaust. In other words the work that it is possible to obtain from heat depends upon the difference in temperature as well as upon the calories present.

Our efficiency terms would be of more practical value if instead of using the calories we should use a modified heat unit consisting of the calory multiplied by the ratio referred to above, taking the value T_2 as the lowest temperature of the surrounding air, condenser water, etc.

This would, of course, increase the mathematical difficulties, but why say that a boiler has an efficiency of 80 per cent. when but one third of that 80 per cent. can be used by an ideal engine. This method would also bring out forcibly the tremendous losses in heating houses by coal, without making use of the power as a by-product. The inefficiency of the steam locomotive is frequently commented upon, but the inefficiency of raising the temperature of a house 10° F. is so much greater that it should be made evident to all.

There is one serious objection to the use of a ratio such as that of Carnot's cycle as part of a unit of heat. That is, is Carnot's cycle the best possible cycle? None other has been developed as yet, but we have not established the proposition that none can be developed.

ALLAN W. FORBES
WORCESTER, MASS.

IN Mr. Forbes's interesting communication, which the editor has been good enought to let me see, he has perhaps overlooked the fact that in a reversible cycle, the efficiency being defined as the ratio of work done to heat taken in for a motor, always less than unity, if the efficiency of a freezing machine or heating plant be defined as the ratio of heat taken up to work done, this will be the reciprocal of the efficiency of the motor, and consequently greater than unity. Evidently the efficiency will be greater the smaller the temperature interval to be covered. This was pointed out many years ago by Lord Kelvin, who called attention to the enormous waste in heating a house, the difference of temperature employed being that from the red heat of combustion of the coal to the temperature desired, when all that is needed is the small