A SLIDING RATE ELECTRICAL METER

IN a paper published in the *Journal of the Institution of Electrical Engineers* of January, Dr. Unz of the Iraq Petroleum Co., Ltd., has suggested a new type of electrical meter, to replace the existing maximum-demand indicators. The object of the maximum-demand indicators is to enable the supply station to charge its consumers not only in accordance with the number of electric units consumed, but also in proportion with the demand on the station at the time during which they were consumed. In the early days of the use of this system, the meter bill consisted of two components, the first being at a constant rate for all demands not greater than a certain minimum rate, and the second component being charged at a higher rate when the demand exceeded this rate. The object was to influence consumers to be economical with their lighting when they were consuming at the higher rate. Economy at these times is most important to the supply company, which is otherwise forced to buy large quantities of expensive reserve plant, used only for a short time every day when the demand is excessive.

Improvements to the demand-charging system have been effected by means of peak-load meters, load-levelling relays and time-switches, as well as by various refinements of the tariffs, but these are of limited application. A meter is required which would automatically fix the price level of each consumed unit as a function of the power at which it is applied, and integrate such prices to a total amount. The consumer would know that the price of a unit consumed at half load would be much lower than that consumed at double full load. He could therefore endeavour to reduce his electricity bill by improving the load factor to the utmost, but need never be afraid of being penalized for exceeding his usual demands. The supply undertaking, on the other hand, would have the full benefit of a rational and simple charging system, without the necessity of providing duplicate measuring instruments and wiring.

An integrating watt-hour meter having a curve for the speed characteristic instead of a straight line would serve the purpose. The meter readings would then not be in kilowatt-hours but in what might be termed 'key-units'. These readings would be proportional to the amounts of money due, as in load-rate prepayment meters or in double-tariff meters with a single counter train.

The speeding-up effect described above can be obtained in a meter either by making the driving torque proportional to a power of the load higher than the first, or by reducing the retarding torque of the brake. Dr. Unz states that the latter method is constructionally easier, and in addition it has the advantage that the existing driving elements with all their compensating devices can be left untouched. The constructional details of the proposed braking element are shown, its equivalent electric circuit is considered, and its performance discussed. The reconstruction of the meter characteristic is outlined, and the errors and compensation methods briefly discussed.

The device offers new facilities in the application of demand charges. It works on the same principle as a standard watt-hour meter, and deviates from the latter only in regard to its speed 'characteristic'.

THE MUSICAL PITCH OF ORCHESTRAS

IN the English edition of the second quarterly bulletin of the "Centro Volpi di Elettrologia" published in Venice last year, there is an interesting article by G. B. Madella surveying investigations which have been recently made on the frequency of the reference note of an orchestra. The history of this problem was discussed in an article in NATURE of November 5, 1938 (p. 820), by Dr. G. W. C. Kaye, who also described the proceedings of the international congress which made recommendations in 1939 (see NATURE, May 27, 1939, p. 905).

Madella describes a series of measurements made during a period of a month in the Electro-acoustic Department of the Istituto Elettrotecnico Galileo Ferraris in Turin at the request of the Italian Committee on Acoustics. Some of the results obtained are given below. A standard frequency of 400 was obtained from that of the institution standard, which operates at 1,000. This gives an accuracy quite sufficient for the purpose. The two tensions thus obtained having the unknown frequency and the frequency of 400 are then applied to a copper oxide modulator. The frequency beat obtained in this way is applied to the plates of an oscillograph and then registered by means of a photographic recording machine. The accuracy obtainable varies according to the time-length of the note studied; as a rule, it is about a tenth of a cycle. Attempts to apply stroboscopic methods were unsuccessful as these methods tire the eye of the observer and are therefore not suitable for systematic measurements.

The tuning frequency, on the average, was found to be above 435; during the transmissions of operas and symphonic concerts, values of the order of 441 were observed.

During the transmission of piano performances or of performances comprising pianos and vocal or string instrument groups, lower frequencies were nearly always observed, often in the neighbourhood of 435, with differences of less than 0·5 cycle. At a violin and piano concert the frequency most often heard was 437·1, but at a symphonic concert the frequency most frequently noted was 442, the maximum being 444·8 and the minimum 439·7.

The results are partly explained by remembering that when a piano is accurately tuned, the tuning is maintained without variations of practical importance. Wind instruments, even if well tuned at the

beginning, have a tendency after a time to increase the frequency of the emitted note because of the heating produced by the breath of the player. Finally, string instruments allow the player within certain limits to follow the tune of other instruments, and the same is the case with singers.

No evidence was found to confirm the generally stated order of variation in which the mean tuning frequency tends to increase during the execution of selections by an orchestra. The frequency of the pitch which is observed during the tuning of instruments before starting the performance tends to be maintained as a mean value during the whole performance. As few tests of this have been made, it would be advisable to make further investigations; if confirmed, it would be of importance in relation to the choice of the steps apt to modify the tuning frequency.

TEMPORARY PRESERVATION OF ANIMAL SPECIMENS

MR. J. R. NORMAN, of the British Museum (Natural History), has abstracted and translated the following from a letter he has recently received from Dr. Paul Chabanaud, of the Museum National d'Histoire Naturelle, Paris:

On learning the news of the sensational discovery of *Latimeria chalumnae*[1], there can be, I imagine, few naturalists who were not seriously perturbed by the thought that it was only by the merest chance that this extraordinary living fossil was not irretrievably lost. Indeed, our congratulations are due to all those who have succeeded in saving this priceless specimen, although we must deplore the fact that its final state of preservation is so far from satisfactory.

Even if fishermen do not often find a representative of the Mesozoic fauna in their nets, how very few of the interesting specimens captured by them daily throughout the world find their way to our museums or laboratories. Even in the case of the species well-known to science, the larger individuals are rarely, if ever, preserved, and our knowledge of the size attained by certain animals (for example, the halibut—*Hippoglossus hippoglossus* (L.); some of the Siluroids; and very many Elasmobranchs) rests largely upon hearsay, or upon the examination of fragments (for example, the 'saws' of *Pristis*).

Naturalists travelling abroad are compelled to forgo the collection of individuals exceeding a certain size (except in the form of skins), solely because their preservation by ordinary methods (alcohol or formalin) necessitates the use of containers so large that their transport is quite impracticable.

There is, however, an extremely simple and quite inexpensive method of preserving animals, both large and small, and in particular fishes: this is by the use of sodium chloride or sea salt. I speak with some knowledge on this subject, as I have used the method myself on many occasions.

All that is necessary is to place the animal in a basin or dish, or preferably on a board or something of a like nature, and to cover it with a heap of salt, being careful to introduce as much of the salt as possible into the mouth and gills, as well as into the abdominal cavity through an incision previously made in one side of the body. The effect of the salt, of course, is to absorb the fluids from the organism. After some hours, that is to say, on the next day at the latest, the specimen should be turned over, drained, and the diluted salt replaced by fresh.

If the animal is of small or moderate size no further treatment is usually required, but if of considerable volume it may be necessary to repeat the operation several times, care being taken to turn the body over each time. Naturally, the hygrometric state of the surrounding atmosphere will tend to accelerate or retard the process as the case may be.

The desiccation of the specimen must be made as complete as possible, since, of course, the sodium chloride does not fix the tissues, and its preserving powers depend entirely upon its strong hydrophilism, the organic tissues treated by the salt being dehydrated and at the same time rendered unsuitable for the proliferation of destructive organisms such as bacteria, moulds, etc.

Thus, it is absolutely indispensable, especially in warm and humid climates, to obtain this dehydration as rapidly as possible, the animal being, in fact, converted into a 'stock-fish', which can be readily packed in any sort of box or crate, with no other packing than the salt itself.

By using this method I have been able to obtain very large specimens of fishes (for example, *Psettodes belcheri* Bennett, a flatfish from the north-west coasts of Africa, and enormous heads of halibut from Newfoundland), which would have been extremely difficult, if not impossible, to procure otherwise.

When the specimen reaches the museum or laboratory it should be soaked in fresh water for just long enough for it to resume its natural form; after this, it can be finally immersed in alcohol or formalin. The complete elimination of the salt is quite unnecessary, since its presence does not harm the final preservation.

I have never experimented myself with a mixture of sodium chloride and sodium sulphate, although I understand that this has given excellent results.

Clearly, this method of salting does not represent the ideal treatment for histological examination, but I can assure you that, not only the external morphology, but even the macroscopic anatomy, is perfectly clear; external characters, bones, viscera, muscles and nerves can all be easily studied. Obviously, the same cannot be said with regard to the blood-vessels or the brain, since special treatment is usually required before undertaking research on these organs.

I do not pretend that the external shape of a salted fish will always compare favourably with that of one which has been placed while fresh in alcohol or formalin. The colours are altered; frequently the scales are displaced. Admittedly the salt is only a makeshift, but how very much better than putrefaction and complete ruin?

I have dealt only with fishes, but there is nothing to prevent the use of salt for the preservation of any kind of vertebrate, provided that such necessary precautions as cutting open the peritoneum and the stomach, etc., are taken.

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