eliminate the difficulty. Thermometers properly made and used with the above circuit have a life far exceeding that of the relay. In fact, the writer has three thermometers which have made over 14,000,000 operations each, without failure, and continue to function perfectly. The original relays have been replaced. Much depends upon the proper design and construction of the thermometer.

The question often arises as to how accurately the temperature of a bath or oven may be controlled by an instrument of this type. Unfortunately, there is no simple answer. Too many factors must be considered, such as the time lag of the bath, its heat capacity and the manner of supplying energy. Suffice it to say, that for close control, lag of the bath should be as small as possible. Good thermal insulation is essential. Forced circulation is necessary; and finally, the energy should be supplied (or withdrawn) at as constant a rate as practical. "On" and "off" circuits are not desirable.

To illustrate, let it be assumed that a bath is to be held at 200° F. Assume that 200 watts is not sufficient to maintain this temperature, even when the environmental temperature is a maximum, and that 300 watts is more than enough to maintain the desired 200° F. temperature even when the external temperature is a minimum. The relay should control only the difference of 100 watts, 200 watts being supplied to the bath at all times.

A simple method of accomplishing this is to place a resistance of suitable size in series with the heating element, allowing 200 watts to pass to the bath at all times. The relay should be connected so that when the temperature of the bath is as high, or above the control temperature, the contact of the thermometer is closed and the resistance is in the circuit. When the bath is too cool and the contact through the thermometer is broken, the relay contacts short the resistance and energy supply to the bath is increased to the 300 watts. Such circuits are easily designed, particularly if a variable transformer such as the Variac, manufactured by the General Radio Company, is available.

The other factors mentioned are beyond the scope of this article.

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## ANOTHER METHOD FOR RECORDING LOCALITIES FROM TOPOGRAPHICAL MAPS

THE method of indicating localities from topographical maps suggested by Clyde F. Reed[1] has certain disadvantages. Not only must one construct an elaborate grid in order to record the localities, but any one wishing to interpret the record must also construct a similar grid. Since topographical maps are now printed in two sizes, both the recorder and the interpreter must have two grids.

A much simpler method, and one which could be used on any map regardless of size or latitude, would be to use the lower left-hand corner of the map as origin, recording in centimeters the distances of the locality from the left-hand margin and the lower margin of the map. Decimals may be used if great accuracy is necessary. As an example, the summit of Taum Sauk Mountain, the highest point in Missouri, would be recorded as: "Edgehill (31.0, 12.4)." This method has the advantage of conforming with ordinary graphing methods.

If it is desired to cut the map in segments for convenience in the field it is only necessary to indicate on the margin of these segments the distances to the margin of the complete map and to add these to the measurements on the segment.

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## A CONVENIENT METHOD OF LABELING BOTTLES

IF labels are typewritten on ordinary paper and then applied on bottles under "Scotch cellulose transparent tape," they can be removed readily without soaking and placed on another bottle if desired. At the same time they are not affected by dilute acids, alkali, oil or organic solvents. The transparent tape should be larger than the label by about one quarter of an inch all around.

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## BOOKS RECEIVED

*Carnegie Institution of Washington Year Book No. 39, 1939–1940.* Pp. xxxi + 326. The Institution, Washington.

RIDER, JOHN F. *Vacuum Tube Voltmeters.* Pp. xi + 179. Illustrated. Author, New York. $1.50.

RUHEMANN, M. *The Separation of Gases.* Pp. xiii + 283. 148 figures. Oxford University Press. $5.75.

SLAUGHTER, FRANK G. *That None Should Die.* (A medical novel.) Pp. 423. Doubleday, Doran. $2.75.

SOHON, F. W. *The Stereographic Projection.* Pp. ix + 210. 53 figures, 1 plate. Chemical Publishing Co. $4.00.

*Tôhoku Imperial University, Science Reports. First Series. (Mathematics, Physics and Chemistry.) Vol. XXIX, No. 3.* Pp. 315–469. Illustrated. Maruzen, Tokyo.

VOSBURGH, WARREN C. *An Introduction to Quantitative Chemical Analysis.* Pp. viii + 356. 27 figures. Holt. $2.75.

[1] SCIENCE, 93: 68.