OUR PRIZE COMPETITION.

GIVE THE HISTORY OF THE THERMOMETER AND ITS USE.

We have pleasure in awarding the prize this month to Miss G. Gilchrist, 12, Drumsheugh Gardens, Edinburgh.

PRIZE PAPER.

The evolution of the thermometer is an interesting one, dating as far back as 1631, when Galileo invented the air-thermoscope, which consisted of a glass bulb containing air, connected to a glass tube, of small bore, dipping into a coloured liquid, which was affected by atmospheric pressure? Such may be said to be the forerunner of the later types, for the Florentine thermometers in use at the Academia del Cinento in 1654 inaugurated by the Grand Duke Ferdinand of Tuscany, were improved by containing a liquid hermetically sealed in a glass bulb, with a fine tube attached, which was a step in advance. Alcohol was the liquid first employed, and the degrees were marked with small beads of enamel fused on the stem.

It was not until the science of thermo-dynamics developed by the great thinkers of the 18th and 19th century, that there was, of necessity, the invention of an instrument for indicating temperature and measuring its change.

The first requisite of such an instrument was that it should always give the same indication at the same temperature.

Temperature is the thermal condition of a body which determines the interchange of heat between it and other bodies. Our first ideas of temperature were derived from sensations of hot and cold. The effect of adding heat to a body is to make it hotter, unless it is at its melting or boiling point. This rise of temperature is accompanied by volume changes, on which all our practical methods of measuring temperature depend.

The two chosen standards of temperature, universally used in grading a thermometer are the freezing and boiling points of water, which evolved from experiments. In 1701, Sir Isaac Newton gave a scale of temperature, where the freezing point of water is given as zero, and the temperature of the human body as 12°.

Fahrenheit, who made the first mercury thermometer in 1721, took as his zero, the lowest temperature then obtainable (from a mixture of salt and ice), and called the temperature of the body 8°. Each degree was subdivided into twelve parts, and subsequently these twelfths were taken as the degree. This made the temperature of the body 96°, and it was found that the freezing point of water was 32°. Shortly afterwards, it was discovered that the boiling point of water was always the same under the same barometric pressure, and a second and easily determinable standard temperature was obtained.

Thenceforward the boiling point of water under a pressure of 30 inches was fixed at 212° on the Fahrenheit scale, the freezing point being as before 32°. With these as standard the temperature of the body is 98.6°.

Lord Kelvin at this time (1848) developed the doctrine of the dissipation of energy, and the definition of the absolute thermometric scale, but different systems of sub-division were employed. The two most familiar scales are the *Centigrade* and *Fahrenheit*. Celsius in 1742 suggested the boiling point be called zero, and the freezing point 100°. The modern Centigrade, inverted this idea, making the freezing point zero and the boiling point 100°.

Réaumur divided the interval between the freezing points into 80 divisions: from 0° to 80° Réaumur.

The Centigrade scale is used on the Continent, and for scientific purposes.

In Britain and America the Fahrenheit scale is preferred.

To transpose temperature readings from one scale to another is a simple matter. It should be remembered that 9 degrees on the Fahrenheit scale, 5 degrees on the Centigrade, and 4 degrees of the Réaumur all measure the same temperature.

Thus to transpose Centigrade to Fahrenheit, double the Centigrade number, diminish it by *one-tenth* of itself, and add 32.

Following the standardisation the thermometer was rapidly adapted to special purposes, the graduate scale being engraved on the stem after the position of the liquid column had been determined for the two chosen temperatures. The convenience of the mercurial thermometer caused it to be largely adopted as it is complete in itself, and can be read without subsidiary appliances. Mercury is also opaque, and does not wet the surface of the glass with which it is in contact. Alcohol is transparent, so has to be coloured when used. In very low temperatures the latter is valuable.

The clinical thermometer for taking the temperature of the body evolved from the type known as the maximum self-registering instrument. In it a construction above the bulb prevents the mercury column flowing back of *itself* into the bulb. Thus the upper end continues to indicate the highest temperature reached until it is shaken down by the operator, thus making for certainty of the indication.

The scale of grading ranges from 95° to 110°, with a special distinctive mark at the mean or normal temperature, *i.e.*, 98.4 Fah. The time of quickest expansion is also noted on the stem, half minute, and so on.

It was recognised from early time that the higher animals have within their bodies certain sources of heat, and also some means of heat regulation, as in both summer and winter their mean temperature remains the same, and with the introduction of the thermometer exact data could be obtained.

It was found in a healthy adult the record average temperature in the axilla is 98.4 Fah., but undergoes slight periodic daily variations of nearly a degree from the mean, being lowest between 2 and 6 a.m.: highest between 5 and 8 p.m. The temperature also differs in different parts of the body. It is lower and more variable on the surface of the skin than in internal organs or closed cavities. If taken under the tongue, will be half a degree higher than under the arm.

The use of the clinical thermometer is the proof that elevation or depression of the temperature of more than

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