Miscellaneous.

History and Construction of the Thermometer.

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PRECAUTIONS NECESSARY TO BE OBSERVED IN CONSTRUCTING ACCURATE THERMOMETERS.

A general idea has been already given of the mode of constructing a thermometer, but where so much accuracy is required, there are many niceties that demand attention.

1. The tube should be of equal diameter throughout the whole stem. As obtained from the glass house, the tubes are in reality frusta of very elongated hollow cones, which by extension, become more or less nearly cylindrical, and as the divisions of the scale are usually equal, it is very important that the tube should not perceptibly differ from a true cylinder.

For these purposes, after a tube has been chosen by the eye as equal in calibre as possible, the best makers blow a bulb on it, and introduce a short column of mercury into the stem, perhaps an inch in length, which is accurately measured on a fine scale of equal parts in different portions of the tube, as the column is, by the heat of the hand, moved from the bulb to the open extremity of the tube. Should the mercurial column subtend the same number of divisions on the scale in every part of the tube, it may be considered as a perfect tube for the thermometer.

The late Mr. Wilson, of Glasgow, introduced thermometric tubes of an eliptical bore. The advantage of this form is, that a very small column of mercury is much more visible when it is expanded at right angles to the line of vision. If due precaution be taken to ensure the equality of the tube, this form answers well, especially for ordinary purposes; but where great nicety is required, we would commend the cylindrical tube.

2. The form and proportion of the bulb may vary according to the purpose for which it is to be applied. The larger the bulb in proportion to the stem, so much more delicately susceptible of changes of temperature will be the thermometer. The spherical bulb is to be preferred, for their shape is least likely to be affected by the varying pressure of the air; but when the bulb is very large, this form renders the thermometer less susceptible of minute changes of temperature, and pyriform or cylindrical bulbs are usually adopted.

In forming the bulb the mouth must not be employed to blow it, otherwise moisture will condense in the tube, which is expelled with much difficulty, and, if suffered to remain, will greatly impair the value of the thermometer. Good instrument makers use a small bottle of caoutchouc, or elastic gum, fastened by a thread on the end of the tube, while the other extremity is softened by the flame of a tallow lamp, urged by a blow pipe. By compressing the bottle, after the orifice of the softened end of the tube is closed by the aid of another rod of glass, a bulb is formed of any required size; but a neat workman will rarely consider the first blown bulb sufficiently well formed for his purpose. It is generally dilated till it bursts; the glass, while still soft, is compressed into a rounded mass, and a fresh bulb formed of a regular shape and size proportioned to the calibre of the tube. Should the artist not intend to seal the tube immediately, he usually hermetically seals the other end of the tube to prevent the entrance of damp air and dust.

3. The necessary precautions used in filling thermometers with mercury are plainly pointed out in Nicholson's Chemistry, viz:—

The mercury should be clean, dry, and recently boiled, to expel air as much as possible. Mercury is often cleaned by thermometer makers by agitating it in a phial, for some time, with sand, and then straining it through leather: for nice instruments it should be distilled from iron filings, or reduced from its sulphurets in clean iron vessels at a moderate heat.

The bulb to be filled, is heated in the flame of the lamp, and the open extremity of the tube is immersed in the mercury; as the bulb cools the pressure of the atmosphere forces through the fluid into the tube and ball. The bulb should be but moderately heated at first so as on cooling to become only half filled.

4. To ensure a delicate thermometer the mercury is next to be boiled in the thermometer. For this purpose a slip of clean paper is to be rolled tightly round the upper part of the tube, so as to form, beyond the orifice, a cup or cylinder, capable of containing as much mercury as the bulb: secure this round the tube with a thread, put a drop of mercury into the paper cavity, and again apply the heat to the bulb, holding the tube by the part covered with the paper, the mercury will soon boil, and about one half of the contents of the ball will rush up into the paper cup. On removing the bulb from the candle the mercury will suddenly return. Repeat this operation again and again, until the speedy boiling of the mercury, and the diminished rise and agitation show that the whole has been well heated, and air and moisture expelled from it. Should there be the least moisture in the tube before this part of the operation, it is very likely to burst the bulb; and the same accident is likely to happen if the mercury be too strongly boiled the first or second time.

5. The tube is now to be hermetically sealed, that is, closed by the fusion of the glass at the upper extremity, which, for this purpose, is previously drawn to a capillary orifice. When it is intended to free the tube entirely from air, which is the best method with mercurial thermometers, heat is again to be gently applied to the bulb, which, at the same moment, is to be softened by another flame, and closed in the usual way, as soon as the mercury reaches the extremity of the tube. When the ball has cooled a little, the sealing is rendered more secure by fusing the glass more fully around the top, so as to completely obliterate the orifice. If the vacuum be perfect, the mercury will fall to the extremity of the tube, on inverting the thermometer, unless the calibre be absolutely capillary; in which case capillary attraction will overcome the force of gravity, and the mercury will retain its position in the tube, in every situation of the instrument. Where there is a complete vacuum in the tube, the mercury must be well boiled before the sealing, as above directed. And when we choose a thermometer, the ready falling of the mercury, on inversion of the tube, is the best test we can have that the mercury has been well freed from air and moisture. This vacuum is not, however, so essential to the true action of the thermometer as was once supposed. A thermometer with a small dilation of the tube when sealed, containing some common air, has lately been recommended as preferable to the instrument with a vacuum on the surface of the mercury.

6. We come now to the last and most delicate step of the process, the adaptation of the scale to the instrument.

In the manufacture of thermometers this is conveniently done by plunging the new instrument, along with a standard thermometer, into two liquids at different temperatures: but the graduation of this standard instrument is a work of such nicety and importance, that a committee of seven members of the Royal Society was formed to investigate the subject, and their elaborate report is given in the society's transactions, where all the requisite circumstances are distinctly noticed, and the best manipulations minutely described. Two fixed points are sought, and the freezing and boiling points of water are most convenient for that purpose. To find the first, nothing more is necessary than to place the thermometer to be graduated, after it is filled, in melting snow, or ice, in such quantity around the ball and tube, as to bring it to the desired temperature. When the mercury has become stationary in the tube, a mark is to be made on the tube with a file, just opposite to the top of the mercurial column, and that mark fixes the freezing point of the scale of the instrument. The determination of the boiling point is much more difficult because it is affected by atmospherical pressure, and even by the form of the vessel in which the water is heated. The Committee of the Royal Society recommend that the boiling point ought to be fixed under a barometrical pressure of 29·80 inches.

The Present Cotton Crop.

Any cry of a short crop from the southern planter is considered an attempt at a panic by the cotton brokers of New York and the spinners of Manchester. But the culture of the cotton-plant and the theory of its production, have been reduced to such unerringly successful practice, and to experiments and calculations, by millions of attentive and observant minds, that neither will hardly allow of any improvement. Any intelligent planter can tell you precisely what effect certain kinds of weather will have upon the cotton crop—whether a rain will make the "squares" "sheer," or "stick;" whether damp, cloudy weather will benefit or injure the devouring "lice," or whether precisely the same season would increase or decrease the "rust." Sometimes drouth benefits, sometimes injures cotton; so also with rain. Through all these changes an intelligent planter can look to the result as certainly as you can tell the effect of a chemical combination. I have been over every section of the cotton-growing country, and my experience and observation enables me to state that any great atmospherical change near the 32° N. latitude, is certain to be general over the whole cotton region. Judging, then, from our experience, let us make a calculation as to the extent of the present crop. An examination of the following causes will enable us to determine: Human or Artificial Causes; these are,

First—Our planters are just learning that first rule of trade—the effect of supply and demand. Experience has compelled them to believe that a shorter crop brings more money; ergo, by general consent they have not increased their crops.

Second—The changing of cotton into sugar plantations, in the States of Texas, Louisiana, Mississippi, Alabama, Georgia and Florida.

Third—The immense amount of labor (entirely black) diverted from the culture of cotton to the building of railroads and factories.

Fourth—The scarcity of corn, from last year's frost, has raised its price from 100 to 200 per cent. (varying in different localities,) and has compelled planters to increase the corn crop. Indeed, I do not know, even under the increased planting of this year, a single farmer who will have corn to sell.

Fifth—The continued agitation of the slavery question has diverted capital from the cotton culture.

I think you will agree with me that these causes are competent to produce some effect. Now for the natural causes—

First—The seed is very much deteriorated by last year's frost; indeed, if next year proves as unfavorable as 1849–50, we shall be compelled to get our seed from Mexico again.

Second—The length of the season, which is six weeks later than usual; this is easily proved by the picking; I have not picked a boll yet, and shall not commence until about the 5th [last week,] although I have had cotton ginned and packed fully a month earlier. My father, a very successful planter, had a saying that he would not give "one stack two weeks older for two, two weeks younger." Every planter knows how good the adage is in a short season.

Third—The cotton stock, thrown back and stunted by the drought, is too small to bear a good or even an average crop of bolls.

Fourth—The immense heat (average 98° in the shade) and no rain (2·95 inches in ten weeks), have forced the cotton plant to an early maturity, and the bolls are not half as heavy as usual, while the continuous drought is causing the bolls and squares to drop continually.

Indeed, it depends upon continuous moderate showers until October, and a very late frost, whether we make a decent crop; though I do not know whether an early frost will damage the crop or not, as this fall is an anomaly in cotton culture. The last crop of "squares," if this is an ordinary season, (frost 15th of Oct.,) have been made about two or three days since; as we do not calculate upon a "bloom" after Sept. 10, and it requires 3 weeks for a square to form a bloom. Last year we had equal to no frost at all, as I have "rattoon" cotton in my corn fields which came up from the old stocks, and has stood four plowings without being killed. Without pretending to estimate the crop, I must say, that I think it (the crop of 1850–51) will prove the shortest of a long series of years.

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La Grange, Geo.

Quadrature of the Circle.

Observing in your paper of the 27th ult., an article on the Quadrature of the Circle, I am led to suggest a few remarks on the subject. —Neither by numbers nor geometry will this question, in all probability, ever be solved —but by a simple experiment in mechanics it can be. Thus, take a block of metal, place the same in a perfect engine and reduce it to an exact square, ascertain how much fluid this square will displace. This can be done correctly by an apparatus that shall leave but a small surface of fluid to be operated on; then take another block of the same material, which should be reduced to the exact thickness of the square heretofore described, place the same in the engine, reducing the other four sides, by turning down until it will displace the same quantity of fluid as the square before described. If correctly done, and the metal have no imperfections in it, the two blocks should weigh precisely alike. This being the case, the square before described is circled, consequently the circle is squared. The proportion of the diameter of the square to that of the circle, or the proportion of the circumference of the circle to that of the four sides of the square, is hereby demonstrated. The square of the sphere, also, is to be obtained by a similar experiment.

EXPOSITOR.

Providence, R. I.

[We have received quite a number of articles on this subject since we noticed the work of Mr. Fleming on the subject. We did not intend to publish any of them, because they reflect no new light on the subject. The above article being short, we thought we would publish it, because others may be wasting their time with the same lucubrations. It is perhaps needless for us to say, that the above leaves the subject in the same region in which it was before, for there is neither formula left to guide, nor proof correctness stereotyped in it.

The Floods of 1850.

This summer has been remarkable for its storms and freshets. We do not remember of a summer in which so many storms occurred, and storms of such a destructive nature. From East, West, North and South, the news of disaster by the overflowing of rivers and creeks, is most appalling. During a part of last week, the State of Pennsylvania in the Lehigh region, suffered greatly. Schuylkill river carried dreadful destruction on its swollen waters. In New Jersey there has also been great loss of property, and New York has had her share of disasters. The dam at the Albany Nail Factory, near Troy, was carried away, and much damage done: in fact, from every State we have news of more or less destruction of property by these remarkable rain storms. The year 1850 will be long remembered for its storms and floods. Old men say they do not remember such a stormy season in all their lives.

Rats for the Table.

There are many parts of the world where rats are eaten, and such rats as would astonish those accustomed to our species, which, take even the largest, are Lilliputian as compared with a native of the East Indies, first satisfactorily described by Gen. Hardwicke in the seventh volume of the "Linnæan Transactions." The specimen he described was a female and weighed two pounds eleven ounces and a-half; its total length being two feet two inches and a quarter. He assures us that the male grows larger, and weighs three pounds and upwards; so that the natives have before them on table an animal as large as a wild rabbit, doubtless, as they have no prejudices or scruples, just as palatable.

The theory and practice of Dr. Cheyne was, "the slightest and least of meats and drinks a person can be tolerably easy under, is the shortest and most infallible means to preserve life, health, and serenity."