Mixing of White with Colored Light.

It was noticed several years ago that when white light was mixed by the method of rotating disks with light of an ultramarine (artificial) hue, the result was not what would naturally have been expected; for, instead of obtaining a lighter or paler tint of violet blue, the color inclined decidedly toward violet, passing, when much white was added, into a pale violet hue. Two attempts have been made to account for this curious fact: Brücke supposes that the light which we call white is really to a considerable extent red, and that the mixture of this reddish white light with the blue causes it to change to violet. Hubert, on the other hand, reaches the conclusion that violet is really only a lighter shade of ultramarine blue. He starts with the assumption that we obtain our idea of blue mixed with white from the sky, which, according to him, is of a greenish-blue color. We then apply, as he thinks, this idea to the case of a blue which is not greenish, namely, to ultramarine blue, and are surprised to find the result different.

Prof. O. N. Rood, of Columbia College, shows, in a paper in the *American Journal of Science and Arts*, that these explanations are hardly correct, since they fail to account for the changes which, according to his experiments, are produced in other colors by an admixture of white. Prof. Rood prepared a set of brilliantly colored circular disks which represented all the principal colors of the spectrum and also purple. These disks were then successively combined in various proportions with a white disk and the effects of rapid rotation noted, a smaller duplicate colored disk uncombined with white being used for comparison. It was thus found that the addition of white produced the following changes: Vermilion became somewhat purplish; orange became more red; yellow, more orange; greenish-yellow was unchanged; yellowish-green became more green; green became more blue-green; cyan blue became less greenish, more bluish; cobalt blue became more of a violet blue; ultramarine (artificial) became more violet; and purple became less red, more violet. Exactly these same effects can be produced by mixing violet with the foregoing colors.

These experiments, says Prof. Rood, seem to explain the singular circumstance that when complementary colors are produced by the aid of polarized light, it is difficult or impossible to obtain a red which is entirely free from a purplish hue, a quantity of white light being always necessarily mingled with the colored light. "In the case of the red, orange, yellow, ultramarine, and purple disks, I succeeded in measuring the amount of violet light which different proportions of the white disk virtually added to the mixture, and found that it is not directly proportional to the amount of white light added, but increased in a slower ratio, which at present has not been accurately determined. For the explanation of the above phenomena, Brücke's suggestion that white light contains a certain amount of unneutralized red light is evidently inapplicable, since the effects are such as would be produced by adding a quantity not of red, but of *violet* light, and for the present I am not disposed to assume that white light contains an excess of violet light. The explanation offered by Hubert does not undertake to account for the changes produced in colors other than ultramarine, and even in this case seems to me arbitrary. Neither have I succeeded in framing any explanation in accordance with the theory of Young and Helmholtz which seems plausible."

Method of Examination for Color Blindness.

The following is the order issued by the Surgeon General of the Navy for the examination of seamen for color blindness:

"Upon the receipt of this order and the colored worsteds to be used as tests, medical officers of ships and stations will make a careful examination of all persons in the navy as to their color sense, the result to be reported to this Bureau according to the accompanying form. Quarterly returns will also be made of the result of the examinations of those who shall be hereafter examined for the service.

"The method to be employed is that of Holmgren, and for this purpose a set of test wools is supplied, which contains three large skeins, 'test colors,' green, purple (pink), and red, and a number of small skeins, the 'confusion colors.'

"The usual mode of examination is by Holmgren's method, which may be briefly described as follows:

"The worsteds are placed in a pile in the center of a piece of white muslin which is spread out on a flat surface in a good daylight. The green test skein is placed aside upon the white cloth, and the person to be examined is directed to select the various shades of the same color from the pile, and place them by the side of the sample. The color blind will make mistakes in the selection of the shades; or a hesitating manner with a disposition to take the wrong shades may show a feeble chromatic sense. The purple test skein is then used. If the test with the green skein has shown the person examined to be color blind, and on the second or purple test he selects only the purple skeins, he is *incompletely* color blind; but if he places with the purple, shades of blue or violet, or both, he is completely *red blind*. If, however, he selects to be placed with the purple, shades of green or gray, he is completely *green blind*.

"The red test skein need not necessarily be used, but it may be employed to confirm the diagnosis already made, for the red blind will select to match the red skein, shades of green or brown which to the normal sense seem *darker* than the red, while the *green blind* will select the shades of green or brown which seem lighter."

The Slow Development of Sugar in Cane.

"Observer" contributes to the New Orleans *Times* the following observations made by him last year, showing the gradual development of sugar in cane:

August 12, wet weather, green joints, no sugar, lower joints polarized 4·8 per cent sugar.

August 19, dry weather, green joints, no sugar, lower joints polarized 8 per cent sugar.

August 21, wet weather, lower joints polarized 8 per cent sugar.

August 28, dry, cool nights, upper joints polarized 4·8 per cent sugar, lower joints polarized 9·6 per cent sugar.

September 10, wet weather, white cane, upper joints polarized 4·8 per cent sugar, white cane lower joints polarized 9·6 per cent sugar.

September 17, dry, bright, cool nights, purple cane, upper joints polarized 6 per cent sugar, lower joints 10·4 per cent sugar.

September 23, dry, sultry, warmer nights, upper joints polarized 8 per cent sugar, lower joints 13·6 per cent sugar.

September 30, dry weather, lower joints polarized 13·6 per cent sugar.

Early December cane of the following description was found, the ground being low and badly drained, and the cane very crooked at the same time: Density, 11·2 per cent (6·2° B.); polarized 8 per cent sugar, which is equal to 71·43 per cent sugar, and 28·57 per cent not sugar.

Juice like this would yield more than half molasses, from whatever percentage extracted out of 100 pounds of cane.

The juice of suckers had a density of 10 per cent (5 56 B.), and polarized 8 per cent, therefore poor in saccharine, but not inferior as to quality. Some planters seem to be made happy by suckers, but the foregoing analysis shows that there may easily be too much of a good thing.

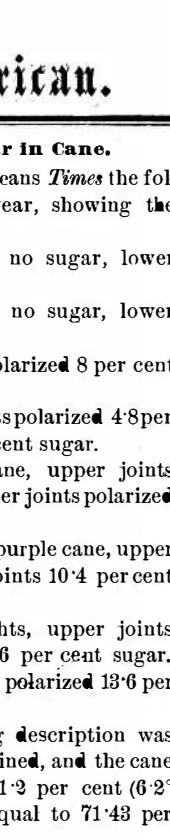
The lower part of good, sound cane showed juice of a density averaging 15 per cent with a polarization of 13·5. This would have been very good if three-eighths of the cane had not been as inferior as the above crooked cane.

From these observations, taken, however, as examples only, it can be seen that cane grown in well drained or easily drying lands, may be as good or even better the 1st of September than cane grown on low marshy soils by December.

STANDARD WIRE GAUGES.

BY M. W. GRISWOLD.

As all civilized nations divide the circle into 360 degrees, and as there can be no variation in any of these, nothing can be more standard than to take one of these angles for a wire gauge, an angle that everybody is familiar with and recognizes as fixed. But with this to begin with, no good would result if we were to select a certain size wire to start with, and then regulate all the other sizes from that (as in the old so-called standard gauges of the present day). This might perhaps do if all makers were to guess alike on their starting size. The metric wire gauge shown in the engraving starts at the center of the circle (or apex of the angle), which having no size is called 0, and to fix upon the points for the other numbers, the metric system is adopted as being a standard measure, and from 0 both sides of the angle are graduated so that one millimeter from the center gives No. 1; from No. 1 two millimeters for No. 2; from No. 2 three millimeters for No. 3; from No. 3 four millimeters for No. 4 (10 mm. from 0), and so on in arithmetical progression with one millimeter as the common difference.



With this gauge there is no guesswork in fixing upon a size, either to start with or to carry out the system indefinitely; and when referred, the exact diameter of any number can be easily calculated without measuring, if one prefers to do so, or does not happen to have a rule at hand.

The metric measure is adopted here, as it is evidently coming into quite general use, Spain having put it into full force throughout her entire possessions on July 15, and Turkey having gone so far as to recognize it.

If the wire consumers were to adopt this metric wire gauge and order from its numbers, the wire drawers would undoubtedly yield to the popular demand.

Mascart's Observations on Atmospheric Electricity.

The apparatus employed by M. Mascart for the measurement of atmospheric electricity is a Thomson's electrometer, in which the deviations of the magnetic needle are mechanically recorded by a pen.

The curves found by means of this apparatus, as described in a recent paper before the French Academy, proved that the potential electricity of the air is generally positive, especially when the sky is clear. On a cloudy day this electricity is diminished, changes rapidly, and is from time to time negative. Rain nearly always produces great deviations. An approaching storm is usually indicated by great negative variations, followed by very extended oscillations, a tendency toward negative electricity being predominant. Rains accompanied by positive electricity are extremely rare, and scarcely ever appear except during storms.

The intensity of the atmospheric electricity, which under ordinary circumstances is always positive, is by far greater and more uniform during the night than during the day. From 9 o'clock P.M. until 3 o'clock A.M., it varies but little: it decreases at sunrise, reaches its minimum against 3 o'clock P.M., rises again rapidly, and attains its maximum at about 9 o'clock P.M. The amplitude of the daily oscillation is much smaller during the winter than during the summer months.

A connection between the electric condition of the air and the temperature seems to exist, but several years may yet pass before this relation can be determined with certainty.

The fact that the maximum intensity occurs at night is contrary to the generally adopted law. According to the observations of Quetelet, in Brussels, two maxima of atmospheric electricity have been held to exist, one in the morning and one in the evening; and also two minima, one during the day, the other during the night. It is of the greatest importance that the observations of M. Mascart have corrected this erroneous assumption, which seems to be based upon imperfect observations.

The direct observation of atmospheric electricity has hitherto been made chiefly during the day hours, and the relative maxima found morning and evening have led to the erroneous assumption that a minimum of electric intensity occurred during the night.

Another very common source of error has also been overlooked, viz., the imperfect insulation of the apparatus. Care should always be taken that the glass supports of the apparatus are not exposed to the changes of the atmosphere. Many wrong observations have probably been caused by neglecting this precaution.

American Public Health Association.

The Executive Committee of the American Public Health Association have announced that the eighth annual meeting of the association will be held in New Orleans, December 7–10. Papers will be presented on abattoirs, epidemics, life insurance in its relation to the public health, the storm water question in city sewerage, the sanitary engineering problems of the Mississippi River, the hygiene of emigrant ships, the prevention of venereal diseases, voluntary sanitary associations, etc. The special questions suggested for discussion at this meeting, in addition to those connected with the papers above referred to, relate to methods of preventing the spread within a town or city—after they have once been introduced—of such contagious or spreading diseases as diphtheria, scarlet fever, yellow fever, measles, small pox, etc., and are as follows: What are the best means of securing prompt and reliable information as to the presence and location of cases of such diseases? What are the best means of securing isolation of the first or of single cases of such diseases, and what are the chief difficulties in securing such isolation? Under what circumstances is it proper to declare such diseases epidemic in a place? Under what circumstances is it proper to recommend the closure of schools on account of the prevalence of such diseases? What precautions should be taken at the termination of each case as to the care and disposal of the dead, the disinfection and cleaning of the room and house, and the period of time at which it is safe to allow the convalescent to return to school or society? Brief, practical papers upon any or all of these points are earnestly requested. Notice of intended papers should be sent to the president, Dr. J. S. Billings, Washington, D. C., or to Dr. E. H. Janes, Secretary, New York.

The Danish Butter Industry.

The Danes have made a marked advance in the butter industry by introducing the following measures:

1. Complete change of the butter season, which commences now on the 1st of November and ends on the 31st of August. In this manner the Scandinavian farmers produce the maximum of butter at the moment when the prices are the highest. While the butter of other countries pours into the London market during the spring and summer, the butter from the North occupies that place during the winter, a season when the scale is the most remunerative.

2. Introduction of Swarz's system into the dairies, *i. e.*, cooling the milk on ice, skimming after twelve hours, mathematical regulation of the churning, working and other manipulations, substitution of long and cylindrical vessels of polished sheet iron instead of little flat bowls of wood, and daily churning.

3. Fabrication of sweet butter, *i. e.*, butter churned immediately after the skimming.

The Racing Record Again Surpassed.

At Chicago, September 18, the celebrated trotter Maud S. surpassed the previously unparalleled record of St. Julien at Hartford (2:11¼) by half a second, making a mile in 2:10¾. On the same day, at Sheepshead Bay, Ferida beat by a quarter of a second the best time on record for a four mile race. The time was 7:23½. For twenty-five years the best time has been Lexington's, at New Orleans, 7:23¾.

Electricity from River Currents.

An inventor of this city proposes to utilize the swift current of rivers by systems of anchored floats carrying current wheels connected with electro-dynamo-machines. The electricity thus generated might be conveyed to factories on the shores and set to work by means of electro-motors; or it might be used for lighting towns, or even for running trains on railways.