and 47 'pan;' for 'dog,' 6 words and 1 blank, with 10 errors; for 'pod,' 51 words and 64 blanks, with 270 errors, of which 'hog' is responsible for 85, 'hod' for 36, 'pog' for 26, 'hard' for 25; for 'land,' 14 words and 12 blanks, with 63 errors, the word being written 'lamb' 42 times; for 'few,' 11 words and 10 blanks, with 15 errors; for 'cat,' 5 words, no blanks, and 5 errors. Of course, these errors may be due to defects elsewhere than in the power of sound-discrimination, e.g., in the power of translating auditory into visual symbols; but the variety and nature of the errors are certainly interesting. If we classify the nature of the confusions, we find that in the vowel-sounds, *a*, as in 'fan' and 'cat,' is most apt to be heard as *a* long 8 of 16 times; that the *e* of 'pen' is heard as a short *a* 69 of 84 times; the *o* of 'dog,' 'log,' 'long,' 'pod,' as a short *u* 83 of 132 times; while the *ew* of 'few' is about equally often regarded as various other sounds. With regard to consonants, *d*, as in 'dog,' 'pod,' becomes hard *g* 132 of 199 times; the *g* of 'dog' becomes *v* 67 of 82 times; the *p* of 'pen,' etc., becomes *h* 240 of 278 times; the *n* of 'pen,' etc., becomes *m* 56 of 78 times; the *ng* of 'long' becomes *n* 7 of 15 times; while *h*, *t*, and hard *c* have no sounds with which they are specially confused. These facts should be of some importance to philologists, and will perhaps agree with the laws of language and dialect transformations.

Color and Taste. — The peculiar association of a color with a sound by which a certain sound will at once vividly arouse a definite color, is quite normal, and has of recent years been frequently described. The association of color with smells is a much rarer phenomenon, and of color with tastes perhaps rarer still. Dr. Férè gives an account of a woman, who, after taking vinegar, saw every thing red for a few minutes, and then every thing as bright green for more than an hour. Dr. Férè explains this as due to a similarity in the subsidiary emotional effects accompanying the sensation.

HEALTH MATTERS.

Use of Tobacco.

C. W. LYMAN, in a communication to the *New York Medical Journal*, discusses in a very entertaining way, tobacco, its use and abuse. Tobacco, he says, contains an acrid, dark-brown oil, an alkaloid, nicotine, and another substance called nicotianine, in which exist its odorous and volatile principles. This description of the active principles of tobacco is of importance to smokers; for, when tobacco is burned, a new set of substances is produced, some of which are less harmful than the nicotine, and are more agreeable in effect, and much of the acrid oil — a substance quite as irritating and poisonous as nicotine — is carried off. These fire-produced substances are called, from their origin, the 'pyridine series.' By great heat the more aromatic and less harmful members of the series are produced, but the more poisonous compounds are generated by the slow combustion of damp tobacco. This oil which is liberated by combustion is bad both in flavor and in effect, and it is better, even for the immediate pleasure of the smoker, that it should be excluded altogether from his mouth and air-passages.

Smoking in a stub of a pipe is particularly injurious, for the reason that in it the oil is stored in a condensed form, and the smoke is therefore highly charged with the oil. Sucking or chewing the stub of a cigar that one is smoking is a serious mistake, because the nicotine in the unburned tobacco dissolves freely in the saliva, and is absorbed. 'Chewing' is on this account the most injurious form of the tobacco habit, and the use of a cigar-holder is an improvement on the custom of holding the cigar between the teeth. Cigarettes are responsible for a great amount of mischief, not because the smoke from the paper has any particularly evil effect, but because smokers — and they are often boys or very young men — are apt to use them continuously or at frequent intervals, believing that their power for evil is insignificant. Thus the nerves are under the constant influence of the drug, and much injury to the system results. Moreover, the cigarette-smoker uses a very considerable amount of tobacco during the course of a day. 'Dipping' and 'snuffing' are semi-barbarities which need not be discussed. Not much effect is obtained from the use of the drug in these varieties of the habit.

Nicotine is one of the most powerful of the 'nerve-poisons' known. Its virulence is compared to that of prussic acid. If birds be made to inhale its vapor in amounts too small to be measured, they are almost instantly killed. It seems to destroy life, not by attacking a few, but all of the functions essential to it, beginning at the centre, the heart. A significant indication of this is that there is no substance known which can counteract its effects: the system either succumbs or survives. Its depressing action on the heart is by far the most noticeable and noteworthy symptom of nicotine-poisoning. The frequent existence of what is known as 'smoker's heart' in men whose health is in no other respect disturbed is due to this fact.

Those who can use tobacco without immediate injury will have all the pleasant effects reversed, and will suffer from the symptoms of poisoning if they exceed the limits of tolerance. These symptoms are: 1. The heart's action becomes more rapid when tobacco is used; 2. Palpitation, pain, or unusual sensations in the heart; 3. There is no appetite in the morning, the tongue is coated, delicate flavors are not appreciated, and acid dyspepsia occurs after eating; 4. Soreness of the mouth and throat, or nasal catarrh, appears, and becomes very troublesome; 5. The eyesight becomes poor, but improves when the habit is abandoned; 6. A desire, often a craving, for liquor or some other stimulant, is experienced.

In an experimental observation of thirty-eight boys of all classes of society, and of average health, who had been using tobacco for periods ranging from two months to two years, twenty-seven showed severe injury to the constitution and insufficient growth; thirty-two showed the existence of irregularity of the heart's action, disordered stomachs, cough, and a craving for alcohol; thirteen had intermittency of the pulse; and one had consumption. After they had abandoned the use of tobacco, within six months' time one-half were free from all their former symptoms, and the remainder had recovered by the end of the year.

A great majority of men go far beyond what may be called the temperate use of tobacco, and evidences of injury are easily found. It is only necessary to have some record of what the general health was previous to the taking-up of the habit, and to have observation cover a long enough time. The history of tobacco in the island of New Zealand furnishes a quite suggestive illustration for our purpose, and one on a large scale. When Europeans first visited New Zealand, they found in the native Maoris the most finely developed and powerful men of any of the tribes inhabiting the islands of the Pacific. Since the introduction of tobacco, for which the Maoris developed a passionate liking, they have from this cause alone, it is said, become decimated in numbers, and at the same time reduced in stature and in physical well-being so as to be an altogether inferior type of men.

ELECTRICAL SCIENCE.

Some New Tests of Secondary Batteries.

IN the last two years the improvements in storage-batteries have been such as to indicate the near approach of the time when they can be economically used for street-car work. Indeed, it is now a question whether, under favorable conditions, they cannot advantageously replace horses; and the result of the experiments on the Fourth Avenue Road in New York, where ten storage-cars will soon be regularly operated, will be awaited with interest.

Dr. A. von Waltenhofen, in the *Centralblatt für Electrotechnik*, gives the results of some interesting experiments on the Farbaky-Schenck accumulators that have a direct bearing on the subject of electric traction. But before giving the results, it is well to call to mind the points in which the present storage-cells are lacking. The principal point is in the small discharge-rate, necessitating a large number of cells being carried by each car (from 3,200 to 4,500 pounds), a corresponding increase in the weight of the car itself to give the strength necessary to sustain this increased weight, a larger outlay for battery and a corresponding depreciation, a greater power to move the greater weight, and the necessity of re-laying much of the track now in use with heavier rails and a better roadbed. For instance: the weight of an ordinary 16-foot car is from 6,000 to 7,000 pounds. Equipped with motors and storage-battery, the weight is about 13,000 pounds. A car equipped with this weight of battery can be run for from 45 to 60 miles, depending on the conditions of the track and the type of equipment.