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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 365,

For the Week ending December 30, 1882.

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THE EDISON ELECTRIC LIGHT.

The difficulties encountered by the Edison Light Company in the development of their public system in this city appear to be serious as well as perplexing. The main difficulty, arising from the lack of unison in the working of the engines, seems to have proved insurmountable except by a change of plan. The president of the company tells the *Post* that it has been determined to replace the engines of the central station by others, one of which is already in position. The experiments made to overcome the defects of the first battery of engines have retarded the work, he says, have made the light uneven, and severely tried the lamps; yet there has been no break in the service, which has been extended from 85 houses with 2,000 lamps to 226 houses with 5,053 lamps, with an average of 3,000 lamps in constant use.

A change has also been made in the price of the light. The charge is now at the rate of $2 an hour for a light equal to 2,000 candles, or about the cost of gas at $2 a thousand cubic feet. Meters for the registry of the current used are being put in as fast as they can be made and tested.

The isolated system has been more successful than the public system. In a year and a half, 154 plants have been established in the United States, employing 29,192 lamps.

THE UNDULATORY THEORY OF ODORS.

The immortal Newton, in common with other savants of his time, believed that light consisted of minute particles emitted from luminous bodies and traveling through space with immense rapidity till they reached the eye. This theory, known as the corpuscular theory of light, has since been almost entirely abandoned by scientific men in favor of the "undulatory theory," so ably advocated by Huyghens, and perfected by Young, Fresnel, Cauchy, and others. When Crookes succeeded in weighing a sunbeam, the corpuscular theory was supposed to have received a fresh lease of life, as better able to explain the action of the radiometer. But the disciples of the undulatory theory soon rallied from the blow, and, notwithstanding the difficulty of conceiving of an imponderable ether, omnipresent and persistent, the undulatory theory still prevails. Not only light but heat is now explained as a form or mode of motion, and the whole phenomena of gases are now explained on the kinetic theory, which has motion for its basis.

Notwithstanding the success that has attended the application of the undulatory theory to the varied phenomena of heat, light, and electricity, chemists and physicists still adhere to the corpuscular theory of smell, and teach that odor is due to small particles thrown out from the odoriferous body. A phenomenon that goes far to disprove this assumption is seized on by chemists to illustrate the smallness of the molecule and by physicists to prove the (almost) infinite divisibility of matter. A few grains of musk will impart a strong odor to the air of a room for years without suffering any appreciable loss of weight. Other instances of non-volatile substances possessing a remarkably strong odor might be cited; a familiar example of a powerful and penetrating odor from a liquid with high boiling point and of very slight volatility is found in carbolic acid, the loss of volume by evaporation being entirely out of proportion to the odor. On the other hand, the fact that many volatile liquids are odoriferous does not prove that it is the particles of liquid or vapor which, coming in contact with the organs of smell, produce the well known phenomena, for there are volatile substances innumerable which have little or no odor. The elementary gases, with the exception of chlorine, are without odor, and many of the compound gases, such as nitrous oxide and carbon dioxide, are void of odor when pure.

Dr. W. Ramsey, of England, has recently called attention to the fact that the lower the specific gravity of a gas the less odor it has, and this we find confirmed in the case of elementary gases by chlorine, which alone is odorous, while its specific gravity (35·5) is more than double that of oxygen (16) or nitrogen (14).

One of the most remarkable phenomena of light, excepting polarization, is that known as "interference." It was impossible to explain this satisfactorily on the corpuscular theory, while it was easily accomplished on the undulatory theory. Sound, which is due to vibrations of the air so large as to be easily observed, does not afford such striking examples of interference as seen in the case of light, yet a delicate ear has no difficulty in detecting such interference in many of the commonest affairs of life, such as two clocks ticking, the interference between musical notes, etc.

If smell depends on vibrations of any sort, it must be possible to detect cases, however rare, of interference. There are familiar instances where one strong odor masks and conceals another, as also of substances of unlike odors combining chemically to produce odorless ones, but it is doubtful if these are true cases of interference. The observation recently made that quinine destroys the odor of musk deserves a closer study to determine whether this is not due to interference, just as red and green light produce white. We do not even know as yet whether odorless substances owe this property to absence of vibrations, or, as in the case of light, to vibrations too long or too short to be taken cognizance of by our olfactory nerves. It is well known that light-waves shorter than the violet or longer than the red produce, on the optic nerve, the sensation of darkness. The range of the eye is scarcely one octave, while the ear distinguishes sounds produced by waves from a few inches to several feet in length, including several octaves. What length of waves are able to affect the olfactory nerves we are not yet able to determine, nor do we know whether disagreeable smells are caused by undulations of greater velocity than pleasant ones, or the reverse. It is probable that each odor consists of several separate and elementary notes; that when these are harmoniously combined the result is agreeable, and that vile odors are simply the result of discord.

One fact may be of use in the study of the undulatory theory of odors: that sunlight causes sneezing, even in the blind, while certain odors produce a like effect.

The difficulty in the way of investigating the subject of smells is the lack of any instrument for measuring odors, all depending as yet on unreliable senses, and all observations being subject to a very large discount for "personal error." When a spectroscope for analyzing odors shall have been invented, it is not unlikely that we shall find certain lines corresponding to certain elements, each being so modified by the other elements in the compound that it is not possible to distinguish it in the general effect on the olfactories. However this may be, it is probable that nitrogen, arsenic, and phosphorus (pentads all), as well as sulphur and selenium, will be found to possess some peculiar modifying power over the others. Perhaps it will be found that simple bodies vibrate only in one plane, like polarized light, but not all in the same plane; that when two elements vibrating in different planes combine, the resulting vibration, being the resultant of two forces, differs from both of them, and hence the odor of the compound differs from that of each constituent. One of the most remarkable and familiar cases of this sort is where odorless nitrogen and hydrogen combine to form ammonia gas, NH_3 with its penetrating odor, which is, nevertheless, so easily destroyed by combination with more hydrogen, and an equal volume of chlorine (HCl).

What effect the shape of the chemical molecule may have on the odor is evident from the fact that all ring-shaped hydrocarbons like benzole, and the double and triple ringed naphthaline and anthracene, are called "aromatic," from their characteristic and remarkable odors. The chain compounds, like the paraffines, have less characteristic odors; but of either class, the greater the number of atoms in the molecule the stronger the odor; yet isomeric bodies often differ in odor, proving still more conclusively that the *shape* of the molecule affects the smell, probably by changing the plane of vibration.

Perhaps we are in advance of the times; the age is not yet ripe to accept the undulatory theory of smell, but the day is not so far distant when discoveries will be made that will establish and sustain our views.

E. J. H.

GAS METERS AS HELPS TO FIRES.

In most buildings designed for multiple tenancy, like our great apartment houses and the capacious office buildings which comprise so large a part of the business part of this city, it is customary to provide a separate gas meter for each room or suite of rooms. These meters are commonly placed in closets and out of the way corners, and are very apt to be surrounded with much combustible matter.

The connections of meters with the gas pipes are usually, if not always, of lead, a metal that is easily fusible, and the solder with which the plates of the meter are joined together yields even more readily to heat.

Let a fire break out in a building containing, as many buildings do, a score or more of these fragile fire feeders, and the hot air sweeping in advance of the fire will quickly melt the lead or solder. The outpouring gas fills the building with an explosive atmosphere which hastens the spread of the flames, and keeps up an inexhaustible supply of fuel. Such burning gas jets, sometimes of great size, are to be seen after almost every city fire, when nothing is left of a building but blackened and broken walls.

The gas poured into burning buildings through such openings doubtless helps materially to account for the surprising suddenness with which many great buildings have been swept by flames; and in all cases the outflow of gas must seriously counteract, if it does not altogether thwart, the efforts of the firemen.

The remedy for this great evil is not so easy to point out. It is obvious that where a multitude of meters are to be distributed through a building, they should be more securely incased, and provided with infusible connections; or some means should be devised whereby the gas supply shall be automatically shut off whenever the temperature rises so as to imperil the integrity of the meter. There should also be near the outer door and readily accessible to firemen some means by which the connection of the house with the gas main in the street can be quickly closed.

There is clearly an opportunity here for useful and profitable invention.

A Licensee Cannot Sue for an Infringement.

Judge Wallace, in the case of Ingalls *vs.* Tice, U. S. Circuit Court for this district, has decided that an agreement whereby the patentee granted to the complainant the sole and exclusive right to sell the patented articles within certain specified territory was not a transfer of an individual part of the whole patent or of the exclusive right of the whole patent for a particular territory. It is simply a license, and does not entitle the complainant to bring suit in his own name, the patentee not being a party to the suit.