

ELECTRICAL SCIENCE.

An instructive lecture, delivered before the Royal Institution of Great Britain, in March last, has been recently published, and contains some very interesting information, which we condense for our columns.

The combustion of metals is a phenomenon dependent on quantity electricity. A battery of two or three cells, which can readily fuse platinum wire, produces no painful sensation upon the tongue, because, although the quantity is abundant the tension is low. The Ruhmkorff coil combines very high tension with considerable quantity; its physiological effects are therefore violent.

The forces of electrical attraction and repulsion are sometimes stated to vary as the square of the intensity, sometimes as the square of the quantity, and sometimes as the square of the distance; but these effects are due to the circumstance that the quantity usually varies in the same ratio as the tension and as the distance. All the phenomena are more rationally explained by the assumption that electrical attraction and repulsion vary in the simple ratio of the quantity and the tension, and of the distance inversely. The instances in which the quantity of electricity present is not simply dependent on the tension, are those in which other electrified bodies are present, which, by their *inductive influence*, affect the quantity present in all bodies in their vicinity, without necessarily affecting their tension. An insulated cylinder, on being connected with the positive pole of Daniell's battery of 600 cells—its negative pole being connected with the earth—had a positively electrified disk made to approach it. One end of the cylinder was thus rendered electrically negative, and it presented the apparent paradox of a negative electrified body giving off a positive current to the earth, and *vice versa*. One end was negatively electrified and the other end positively, but the tension was the same everywhere, and a powerful and visible current was given off to the wire connected with the ground.

The fall of tension in electricity is always accompanied by conversion into heat; the ignition of wire by the voltaic current, the intense heat of the voltaic arc, and the heat and light of the electric discharge and of the spark, are all cases of the evolution of heat consequent on the fall of tension, and the quantity of heat evolved is apparently directly proportioned to the fall of the tension within a given space and to the quantity of electricity passing.

In the case of electric telegraph conductors and submarine cables, it has been shown, from carefully conducted and extensive sets of experiments, that the tension falls with the most perfect regularity from the positive pole of the battery to the end in connection with the earth, in accordance with the law of Ohm. The quantity of electricity held under induction varies with the same ratio as the tension; therefore, the distribution of the charge in a submarine cable, follows precisely the same law. If a cable with a current flowing through it, be divided into any number of equal sections, and the quantity in the section connected with the earth be taken as unity—the quantities in all the other parts, whatever may be their number, will be in the ratio 1, 3, 5, 7, 9, 11, &c.

In a voltaic battery, the presence of two metals is not an essential condition. A negative metal is not necessary for the formation of an electric current, but only for its detection and exhibition. A simple mass of copper, iron, zinc, or any oxydizable metal, when laid on the moist earth, forms a complete battery in itself, giving positive electricity to the earth and quickly assuming a negative tension, which it communicates to any other body resting on it or in contact with it, such as a length of submarine cable. If a cable thus charged were removed and applied to a more electro-negative metal, such as platinum, or to a mass of carbon, the charge would return to the earth. By measurement it has been found that the charge thus acquired by a cable, is exactly the same as if the two metals had been employed simultaneously in the ordinary form of a galvanic couple. If a mass of zinc is connected with a non-oxydizable or a less oxydizable metal, and with the earth, the tension being constantly destroyed and as constantly renewed, it will form a constant current and become a voltaic couple. It is the same with a mass of iron occupying the same position as the zinc. If the con-

nection with the earth is made through any inert conducting substance or liquid, instead of through another metal, a constant current is also produced, thus forming the well known case of a voltaic battery with one metal and two liquids. This may account for the rapid corrosion of some marine steam boilers, which use condensed fresh water, when they are connected with copper pipes, and communicate with the salt water.

In recent investigations in electricity, it has been observed that every different dielectric possesses its own specific law of variation and inductive capacity with respect to distance. With air it varies as the distance inversely; with gutta percha it is more nearly as the square root; with india rubber and white wax, it is intermediate between the two; in short, it varies with almost every different substance that has yet been tried.

WAGES OF THE POORER BRITISH CLASSES.

Under this head, the London *Mechanics' Magazine* states that the working men of Great Britain are deeply indebted to the Statistical Society, which has published elaborate papers on the wages of agricultural laborers, mechanics and artisans, thus affording information respecting the improvements in the condition of the "working classes."

Exactly 200 years ago, the justices in some of the English courts fixed the weekly wages of agricultural laborers at 7s. per week in summer, and 6s. in winter. The pay of mechanics at that time was the same as those laborers. In 1824, the average wages of agricultural laborers in nineteen counties of England had risen to 9s. 4d. per week; in 1837, to 10s. 4d. (English); and in 1860, to 11s. 7d. In two centuries, the wages of the worst-paid class of labor has nearly doubled in England, while machinery has increased in a tenfold ratio. Those who have so unintelligently complained that an increase of machinery robbed the workmen of employment, and thus greatly injured them, have but to look at such statistics for the most complete confutation of their crude reasonings.

During the past two centuries, the wages of most of the mechanical operatives in Great Britain have increased fourfold. Mechanics that received only 6s. or 7s. per week in 1660, now receive from 24s. to 40s. per week. In 1800, the wages of a good mason was 16s. per week; now it is 33s. The increase of wages during the past 30 years has been about 20 per cent. In Manchester, the chief seat of the cotton manufacture, the increase has been from 13 to 25 per cent. The wages of engine tenders in 1839, were 24s. per week; now they are 30s. The wages of piecer boys have advanced from 8s. to 10s. The young men and boys engaged as silk spinners, who received 7s. and 6d. in 1839, now get 10s. A shilling is about twenty-four cents of our money.

These are some of the statistics presented, but they do not convey a correct idea of the real increase in the rewards of labor and the comforts obtained by the working classes, for, with such a great increase of remuneration, there has been a general decrease in the hours of labor and a very great decline in the price of most necessities of life. In cotton manufactures, there has been a decrease in the hours of labor amounting to about one day in the week, and other mechanics about half a day weekly. The reduction of the hours of labor, it is stated, has not been brought about by the agency of strikes.

The clothing of the working classes has been reduced in price in a far greater proportion than their wages have been advanced. The female factory operatives and domestic servants now dress in silks and the finest qualities of woolen and cotton fabrics. One century ago, only coarse woolen apparel was worn by them; silks and fine cottons were unknown below the nobility and the wealthy merchants.

In short, there has been a most gratifying improvement in the condition of the producing classes of Great Britain, and this improvement is still going on, and, strange as it may seem, this progress seems to go forward as if it had joined hands with all the new improvements and useful applications in machinery. Reasoning from such data, the conclusion is inevitable that those mechanics who invent improvements in mechanism not only benefit themselves individually, but, at the same time, raise their fellow-workers one step higher with every new and useful invention.

European News.

By late news from Europe we learn that the Sultan of Turkey, Abdul Mejid, died on the 25th of last June, and was succeeded by his brother, Abdul Azry Khan. The late Sultan was a man of weak mind, and during his late years a complete inebriate. It is to be hoped that the new Sultan will reign with vigor and conduct his affairs without displaying Mahomedan bigotry against the Christians.

John Campbell, Lord Chancellor, of England, died on the 23rd of June, in London. He went to bed on the night previous in his usual health, and was found dead in his bed next morning, having expired from the bursting of a blood vessel. He was nearly 82 years old when he died, and had risen from the station of an humble Presbyterian minister's son, in Scotland, to fill the offices of Lord Chief Justice and Lord Chancellor of England, and was a Peer of the Realm. He was distinguished for great energy, integrity, and a clear intellect. During five years, while preparing for the bar, in London, he supported himself as a contributor to the London Press. It would thus appear that in England, the highest stations in the realm, with the exception of the crown, are open to the people.

A great fire had taken place in London, by which about \$10,000,000 worth of property in houses and merchandise had been destroyed. Immense piles of warehouses were devoured by the fiery element, and the Superintendent Fire Engineer, Mr. W. Braidwood, and several of his men were killed by the walls of a building falling upon them. Such a serious and painful catastrophe has not occurred in London for quite a number of years.

The Abundance of Food.

The most cheering and satisfactory offset to the discomforts, inconveniences and losses induced by the war, says the *St. Louis News*, is the unexampled abundance of food in the land. We have consumed scarcely half the surplus grain of last year, and yet a new crop, larger even than the last, is ripening to harvest. The damage by the army worm is scarcely seen, and not felt at all.

In Illinois the farmers have barns filled with old corn, which they would gladly sell at 15 cents a bushel, and old wheat which they cannot dispose of at 50 cents; and yet, the best crop of wheat and oats ever gathered stands in their fields almost ready for the sickle. In Missouri, Iowa and the entire northwest, there is a similar promise of abundance; and in Kentucky, the harvest, now going on, is said to be all that could be wished.

Speculators in food will not make their fortunes, during the war, by investments in grain. But the people will live. No country was ever injured by cheap food; and it certainly is a cause for profound gratitude to the great Giver of gifts that in spite of the hardships of the war, the necessities and even the comforts of life are so unprecedentedly abundant and cheap as they are at this time.

Street Railways.

City passenger railways, which were greatly opposed at first in England, are now becoming quite popular. The two tracks—only about two miles long—laid down by Mr. Train in London have been very successful. No less than 170,000 persons were carried over them in seven weeks. The Board of Trade has made a very favorable report upon them, and two other roads, of greater length, are now being constructed in the British metropolis.

In Bristol, Portsmouth and Exeter, arrangements are now being made for introducing the system. The next improvement will be the adoption of steam or compressed air engines, in place of horses, for working such roads. We ought to show the English a good example in this line also.

A TRICK IN THE LEATHER TRADE.—We have lately seen considerable quantities of upper leather, of hemlock tannage, colored with yellow ochre and other substances to resemble oak tanned. Such disguises are easily detected; and for the expected profit there is substituted a loss, both pecuniary and moral. We advise the tanners, when there is a demand for oak leather, to leave the hemlock to take care of itself, and honestly produce what is required.—*Shoe and Leather Reporter*.