

Novelties in Science, Art and Literature.

Light Without Heat.

Not since Edison, in 1879, proclaimed the success of his efforts in subdividing the electric current, making incandescent electric lighting possible, has there been so important an announcement in the electrical world as that made last week by Mr. Nikola Tesla that the advances made by him in vacuum-tube lighting had reached a point that assured complete commercial success.

The result of Tesla's work in the field of currents of high frequency were first made known to the public in his now famous London lecture of 1891. In 1892 he gave the same lecture, with a large number of brilliant experiments, before the National Electric Light Association at St. Louis.

The results then exhibited were startling, and aroused the most intense interest. At that time, however, Mr. Tesla himself admitted that his work was not yet commercial. Few even of his staunch adherents believed it ever would be.

Now, after four years of hard work, and having been delayed by the fire which destroyed his laboratory and much of his most valuable apparatus, the great inventor is jubilant over the measure of success achieved, and has broken the long silence which he has persistently maintained in regard to the progress of his work.

"Four years ago when the first public

announcement was made of the results of my work in vacuum tube lighting," said he recently, "I found few people who would admit that I had anything more than an interesting laboratory experiment. My visitors all said, 'What beautiful effects!' and in the next breath, 'How utterly uncommercial.'"

"To-day I believe, not that the ultimate is attained, but that I have already produced a thoroughly practical and commercial method of vacuum-tube lighting, vastly more economical than either the arc or incandescent systems, and which will be a marked advance over the present method."

"I found the causes of loss of energy and have largely overcome them. Already I can deliver 10 per cent of the initial energy in a pure white light. This is three times the efficiency of an ordinary incandescent lamp."

"I have long since discarded the vibrator. I found it impossible to produce one which would last more than a few hours, so I found a better way, and now use no vibrator at all."

"But, Mr. Tesla," the reporter said, "how can I explain to a layman just how you start the ether in your exhausted bulbs into such rapid vibrations and produce this light with no mechanical vibrator?"

"You can't explain it. I don't know that I could. You might say," said Mr. Tesla laughingly, "that it is the music of the celestial spheres."

"There is no direct connection between my conducting copper wires and the interior of the exhausted bulbs. The current passes through the glass. There is no vibrator, no mechanism."

"Asked what vibratory speed is now attained Mr. Tesla replied: 'About 6,000,000 a second now. In a short time I expect to produce 50,000,000 per second.'"

"How do you measure them, Mr. Tesla?"

"In two ways, one of which I will not describe. But the second is by my ear only. Taking one of these little bulbs I can distinguish the periods of vibration almost as accurately as the musician can distinguish the tones of the scale from his tuning fork."

"The light produced by Tesla's latest tubes is pure white, possessing all the visible qualities of sunlight. Moreover, according to the great inventor, it has all the purifying qualities of sunlight, and in a room, well ventilated, would be equally healthy to live in whether lighted by one or the other."

"I more than believe that in gas lighting there is less than 1 per cent efficiency in incandescent electric lighting less than 3 per cent, and that Tesla can already show 10 per cent, with a promise of getting a great deal more, the importance of his discovery in the commercial world is apparent."

"No expensive or complicated apparatus is needed. A simple coil is provided, which transforms the ordinary low-tension current, making it available for use almost anywhere."

"A particularly attractive feature of the new light is that the new bulbs, once exhausted, have a practically unlimited life. Mr. Tesla has some which have been in use in his laboratory almost continuously for four years, and are still burning with undiminished brilliancy and consuming no more energy than when first lighted."

"One little bulb now burning in the laboratory is sufficient for a parlor of ordinary size, giving out as much light as an arc lamp, glowing steadily without any wavering, and consuming but a fraction of the energy."

"With the success of this vacuum bulb-lighting system practically assured, the tireless inventor has not relaxed his efforts and is working harder than ever."

"Next in his mind is the perfection of the oscillator, and after this, nothing less than telegraphically and telephonically."

"I do not actually believe that it is possible," Tesla was asked, "to more than believe it. I am sure of it. Further than that, I believe that with this grand force nothing is impossible. Even the most optimistic or visionary dreamer would fail to predict the accomplishments of the next decade."

Flight Is a Fact
Professor Alexander Graham Bell, the inventor of the telephone, has witnessed the trial flights of the machine devised by Professor Samuel P. Langley, formerly of Puttysburg. Mr. Bell makes the following statement:

"I witnessed a very remarkable experiment with Professor Langley's aerodrome on the Potomac River. Indeed it seemed to me that the experiment was of such

importance that it should be made public. I should not feel at liberty to give an account of the details, but the main facts I have Professor Langley's consent for giving you, and they are as follows:

"The flying-machine, or 'flying-machine,' in question was of steel driven by a steam-engine. It resembled an enormous bird, the whole contrivance weighing twenty-five pounds. Its light steel framework holds extended horizontally three sheets of thin canvas, one above the other. The length over all is fifteen feet. The engine runs two propellers."

"Professor Langley will soon construct a flyer of large size, which will carry a proper mechanical equipment and be capable of extended flight. The one described is only a model for experimental purposes. The inventor has not troubled himself to any extent about the question of a suitable engine, which could be furnished easily enough when needed. The

whole contrivance weighs twenty-five pounds. Its light steel framework holds extended horizontally three sheets of thin canvas, one above the other. The length over all is fifteen feet. The engine runs two propellers."

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spinners, each supplied with a suit of sails that can be handled independently or together.

There are two jibs arranged in the same way. On either side of the bowsprit there is a step secured to the hull. A spinnaker boom is mounted on each. One of the jib-stays goes to the top and the other goes to the masthead. This, of course, makes the jibs of different sizes, but that is the way they would be in a schooner. The sail area of this vessel is nearly three times that of an ordinary sloop, and there is no doubt but that in sailing before the wind she would be able to make good time. The spinnaker is adjustable, so that when necessary it can be lowered and the vessel put under jury rig in a very few minutes.

Substitution for Amputation

A new and simple mode of treatment has been introduced in France, by which, it is claimed, a large proportion of injured limbs now usually amputated can be saved. The method, which is due to Dr. Reclus, was recently described before the French Congress of Surgery, and is explained by the hospital: Whatever the extent or gravity of the lesions, he never, under any circumstances, amputates the injured limb, but merely wraps it in antiseptic substances by a veritable 'embalming' process, leaving nature to separate the dead from the living tissues. This method of treatment possesses the double advantage of being much less fatal than surgical excision, and of preserving for the use of the patient a part of the limb, at any rate a much larger part than would be left after amputation. He advocates this very conservative treatment on account of the excellent effects of hot water, which he uses freely. After the skin has been shaved and cleansed from all fatty substances by ether, etc., in the usual way, a jet of hot water is made to irrigate all the injured surfaces, and to penetrate into all the hollows, which he uses freely. After the wound, without exception. This is the only way of removing all clots, and to wash away all foreign bodies, together with the micro-organisms they may contain. The advantages of hot water at this high temperature are threefold—(1) hot water at this temperature is antiseptic, heat greatly increases the potency of antiseptic substances; (2) is hemostatic (that is, stanches the flow of blood); (3) it helps to compensate for the loss of heat, resulting from the bleeding, and especially from the traumatic shock. After the 'embalming' process, and the dead tissue has been separated from the living, the surgeon has to do the rest, to give the patient a suitable spot. According to Reclus, the results obtained are remarkable.

It is in addition to these general motions a tornado whirl, owing to the variations in the local conditions which regulate its development, frequently oscillates up and down, now descending to the earth and again whirling harmlessly overhead, and swaying from side to side, occasionally doubling over its path, but only within narrow limits, and always maintaining a generally easterly course.

From the theory it appears that while the velocity with which the tornado is propagated is no greater than that of the middle stratum of the cyclone within which it is generated, viz, forty-four miles an hour, according to Finley, the velocity of the air round the center vortex may rise to 500 miles or more per hour.

As a matter of fact, Finley has measured effects which can only have been produced by such velocities, and we may take it that the horizontal force of the wind, near the center, is frequently as much as 250 pounds to the square foot, sufficient to wreck any building, especially when in consequence of the arrival of the traveling vacuum over it, the air within exerts this force in bursting the roof and walls outward. In

the case of the memorable tornado at Mount Carmel, Ill., on June 4, 1877, the lifting force of the vortex appears to have lasted long enough to perform a most singular feat. "Since by it the spire, vane and gilded ball of the Methodist church were carried fifteen miles to the northeastward."

Fortunately, in comparison with the long paths of cyclones proper, which have been traced nearly round the globe, the length of the track of these cyclones is usually not more than twenty miles altogether, and it only comes to earth, so to speak, through a portion of it. Consequently, although terribly destructive within their limits, the chances of a cyclone striking a large city in the tornado area of the States is not large, though when, as in the present case, it does so, the destruction is on a terrible scale, and with the annual increase in population in cities will tend to increase.

One line of both practical warning and fruitful investigation appears to be emphatically taught by the theory of tornadoes, and that is the measurement of temperature in a vertical direction. Upon this the formation of a tornado chiefly depends, and, apart from all other prognostics, one of the best ways of forecasting the probable presence or absence of tornadoes would be to attach a series of thermometers or thermographs to kite or small balloon wire and keep a daily record of the differences at certain heights.

Any abnormal difference, especially in the direction of heat below and great cold above, is the possessor of a remarkable relic in the shape of a human hair preserved in a jar of alcohol. It appears that Shelley, the poet, feared that there was a chance of being buried alive. To guard against any such contingency he left directions that his hair should be removed immediately after death. The queer relic may still be seen by any one

medium for spreading very serious eye diseases. Dr. Fick has shown that winking is more frequent as the retina becomes more fatigued, and it has been found that in reading at a distance of thirty centimeters the number of winks per minute is 1.3 with electrical illumination, 2.8 with daylight, while with weak illumination which only permits reading at eighteen centimeters the number is 6.8 per minute.

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often misinterpreted, was explained as long ago as 1793 by Franklin in the following characteristic and simple words: "The spout appears to drop or descend from the cloud though the materials of which it is composed are all the while ascending, for the moisture is condensed faster in a right line downwards than the vapors themselves can climb in a spiral upwards."

Such is the modern theory of the tornado, developed by Ferrel, exhibited in our illustrations, and found to be in complete accordance with recorded facts.

Theory shows that tornadoes will prevail where the geographical conditions are favorable to the facile movement of cold air from the north alongside or above warm air from the south. Such an area exists par excellence over the flat river basins of the Mississippi, Missouri and Ohio, and as a fact we find the States embraced by their area most visited by tornadoes. Independently of geographical locality such a crossing of currents, especially cold over warm, occurs in the S. E. coast of a cyclone and it is precisely in this part of a cyclone or what is frequently termed a "low" that tornadoes are generated. The same ocean when the vertical temperature differences are less marked is frequently the seat of a small subsidiary "low" in which thunderstorms occur. A thunderstorm, waterspout and tornado are in fact first cousins.

Another factor favorable to tornado formation is a sluggish movement of the air, allowing a local accumulation of heat and moisture, causing what is termed oppressive weather, and since such heating up near the surface, with cold air overhead, occurs most readily in the early summer it is not surprising to find that the researchers of Lieutenant Finley place the month of May as that of greatest tornado frequency. When the sun is loaded it only requires the exercise of a small muscular effort to release an immense potential energy.

Similarly in the case of the tornado, the heat and other conditions may have been accumulating for some days, but the moment favorable to its sudden transformation is when the daily temperature has reached its highest point, that is in the afternoon, and though tornadoes have been recorded at all hours of the day they are most common in the afternoon. Again, since they occur on the southeast side of a cyclone they travel in the same direction as the air moves in this part, viz, from southwest to northeast, and as the conditions favor their development chiefly on this side of the area if there is more than one tornado they will usually travel along parallel paths.

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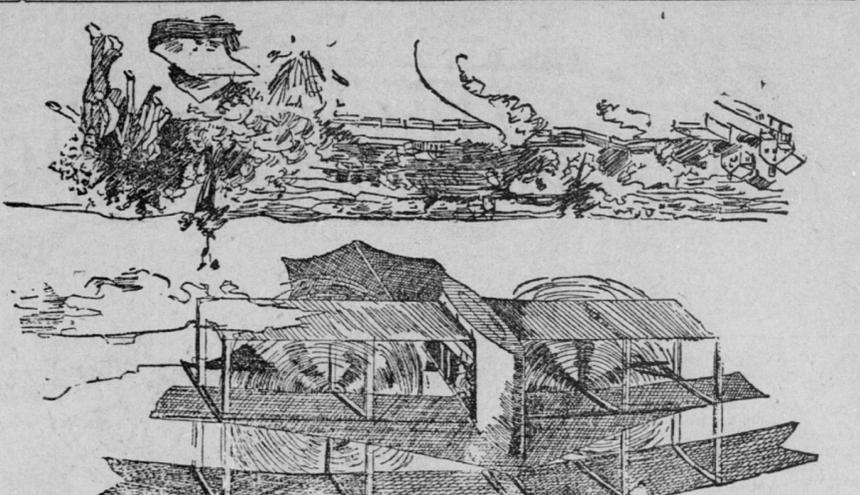
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A well-known and very prominent English family is the possessor of a remarkable relic in the shape of a human hair preserved in a jar of alcohol. It appears that Shelley, the poet, feared that there was a chance of being buried alive. To guard against any such contingency he left directions that his hair should be removed immediately after death. The queer relic may still be seen by any one

medium for spreading very serious eye diseases. Dr. Fick has shown that winking is more frequent as the retina becomes more fatigued, and it has been found that in reading at a distance of thirty centimeters the number of winks per minute is 1.3 with electrical illumination, 2.8 with daylight, while with weak illumination which only permits reading at eighteen centimeters the number is 6.8 per minute.

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