MAGNETO-ELECTRICITY FOR LIGHT-HOUSES.

A very interesting paper was lately read before the Society of Arts, London, by F. H. Holmes, Esq., on the application of the electro-magnetic light to light-houses; he gives a brief history of sea-coast lights, and we produce the substance of his paper as follows;—

"Formerly light-houses were few, and the lights consisted of coal or wood fires, kept up on high cliffs or towers. But as shipping increased, the light-house system was developed; and the coal fires gradually gave way to oil lamps, with spherical mirrors behind them as reflectors; these were then superseded by parabolic reflectors, and most recently the 'Fresnel lens' has taken the place of the reflectors. This lens has been increased in size, so that in first-class light-houses its diameter is 6 feet, hight 10 feet, and the size of the oil lamp used has been increased in proportion. The lamp has four concentric wicks, the largest of which is about 4 inches in diameter. The Fresnel lens consists of a middle refracting belt and a double series of reflecting prisons or zones; when properly constructed it has the property of collecting all the rays into one horizontal beam, so that all the light from the lamp is utilized by its rays being thrown directly forward. Whether a large or a small lamp is employed, it makes no difference in foggy weather, while the thickness of the flame is the same. Quantity of light does not add to the penetrating power in a mist. The great object now with those who are devoting attention to the improvement of light-houses is to obtain a light of great intensity to penetrate further into mists, and electricity has been found to be the most intense artificial light known. But to be effective and reliable it must be steady. Frictional electricity produces a succession of intensely vivid flashes, and might be used for the purpose in a perfectly dry atmosphere; but the slightest moisture conveys the charges to the earth. The electric light obtained from a galvanic battery is intense, but the current is not constant; it becomes weak as the solution in the battery becomes saturated by the decomposition of the elements. Currents of electricity can also be produced by the magneto-electric machine, for which no battery is required, and a constant current can be obtained while the helices of the machine are made to revolve with uniform speed.

"The electricity derived from a magneto-electric machine is induced in coils of wire, by the changing of the magnetic polarity of pieces of soft iron enclosed within the helices, and the quantity or intensity of the induced current depends, first, on the amount of magnetism induced in the soft iron; secondly, on the facility with which the poles of the magnetized soft iron can be reversed; thirdly, on the velocity with which the change of polarity takes place, and fourthly, on the length and thickness of the wire forming the helices. The amount of magnetism induced in the soft iron depends on the size and force of the steel magnets employed, and on the weight and softness of the iron in the helices. In practice, the weight of the soft iron is limited by the weight of the steel magnets; for if too heavy, these will yield their magnetism too slowly. To facilitate the change of the poles, the soft iron cores of the helices are made tubular—the tubes being single, double, or treble; as it has been found by experiment that the same weight of iron, when thus divided, loses and takes magnetism in less time than in the solid form. The amount of electricity in such a machine depends upon the amount of magnetism taken up from the permanent steel magnets, and the soft iron takes time to become saturated with magetism. If the velocity of such a machine therefore be too great, there will not be sufficient time for the soft iron cores to become saturated. It is necessary, therefore, to ascertain the maximum velocity, which may be done by experiment. The length and thickness of the wire must be in accordance with the current required. A thick short wire forming the helices represents a galvanic battery, composed of a small number of large pairs of plates, while a long thin wire represents a battery composed of a large number of small plates. Thick short wires give quantity of electricity; long thin wires give electricity of intensity. From this it results that there are certain laws known by which a magneto electric machine can be made to give a current of any given amount of electricity, with any given ratio between its quantity and intensity. The current of electricity thus obtained is different from that of a galvanic battery. While the helices are revolving, the direction of the current is reversed, as the core of soft iron passes each consecutive pole of the steel magnets. Or the permanent steel magnets may be revolved, and the helices remain stationary. An improved machine of this character has been invented and employed for light-houses, by Mr. Holmes. The current is under perfect control, and is conveyed to carbon points; the light obtained is uniform and steady. Its power may be increased without increasing the size of the lenses, and its power may be so increased as to give sufficient light to read at a distance of twenty miles. In intensity for penetrating haze, it is second only to the sun, and it is so purely white that it can be easily distinguished from all other artificial lights. An objection has been made to this light, that, being so small, it would be altogether invisible at a considerable distance; and when we merely consider that the apparent size of distant objects depends on the visual angle, there seems to be some ground for the objection. But the law of visual angles does not apply in the case of self-luminous bodies, as can be demonstrated with a piece of fine wire, which is almost invisible even with a strong light thrown on it; but by a current of electrity it is made self-luminous, and appears gradually to increase in diameter as it becomes brighter. The last point to be considered is the cost of the magneto-electric light as compared with oil. The French director-general of lighthouses has made a report to his government both as to first cost and as to cost of maintenance; both are greatly in favor of the magneto-electric light; of course, in making their calculations of cost, they take the cost of an equal quantity of light in each case, that is, by oil and electricity.

"This light has been in constant use in Dungeness light-house on the English coast, since June 1862. There are two small lenses in the lantern, and two regulators to each. Only one light is shown at a time, but there are two regulators for each lens, so that an instantaneous change from one to the other can be made without extinguishing the light when fresh carbons are required. In the machine room there are two magneto-machines, each capable of giving a powerful light, though both are in constant use. There is a direct-acting steam engine attached to each machine, and two Cornish boilers, each capable of generating steam enough for the two engines. The material consumed at Dungeness is about 30 to 35 pounds of coke per hour, and $5\frac{1}{2}$ inches of graphite in the regulator per hour. The principal item of expense is at present, the engineer, who has charge of the apparatus. The magneto-electric machines at Dungeness contain 120 horseshoe-magnets of about 50 pounds each, and 160 helices. This light has been seen by the captains of steamers at a far greater distance than that of the oil light. Professor Faraday, in his reports laid great stress upon this. All that was necessary was to double the number of magnets, and practically this was easily done, because there were duplicates of everything in such lighthouses, and in foggy weather it was possible to bring the power of both machines to bear upon one instrument; and in that way double the intensity of light could be obtained. In France a double light of this description has been ordered to be placed at Cape La Heve near Rouen. The cost of this light compared with oil had been gone into by M. Regnault, director-general of light-houses in France, and he had calculated very fairly on the principle of light for light; and reckoning in this way, including the expenses of alteration, taking down the large lens and putting in two smaller ones, putting up the apparatus, two steam-engines complete, and the buildings to contain them, the whole of the cost was calculated at half that of an ordinary first-class light-house, light for light. The actual expense was greater than in an ordinary light-house, but when the quantity of light was considered, it was less by one-half, whilst the working expenses were only one-third. The light at Dungeness was equal in quantity to fourteen of the large oil lamps with four concentric wicks. The power which this light possessed of penetrating to a great distance constituted its superiority to any system of lighting now in use. Of all the lights produced by chemical means, that of the combustion of hydrogen and oxygen gases upon a ball of lime was the most intense; but electricity is far more intense than any chemical action."

Photo-Sculpture.

The *Journal of the Society of Arts* says:—References from time to time have appeared in the papers respecting this novel application of photography. Preparations are being made in Paris for carrying it out on a very extensive scale. The results are stated to be very successful. The *modus operandi* will be very easily understood. The sitter or object to be sculptured is placed in the center of a well-lighted, spacious apartment; twenty-four or even a larger number of cameras are ranged around him, at equal distances from each other, with plates duly prepared, and by a simple mechanical arrangement the operator, by one movement of the hand, simultaneously uncovers all the lenses, and after a sufficient length of exposure closes them. The plates are then developed in the usual manner, a sufficient number of operations being employed for the purpose, and proofs are subsequently printed. There are thus obtained twenty-four or more views of the subject from twenty-four or more different points of sight. Each view is then in succession, by means of a magic lantern arrangement, thrown upon a screen on an enlarged scale. In order to transfer these likenesses from the photographs to the modeling clay, an instrument on the principle of the pentagraph is then made use of, having a tracer at one end and a cutting tool at the other. The lump of modeling clay is fixed on a stand capable of turning on its axis, with divisions corresponding to the number of photographs employed, and is placed in a position so that while the tracer of the pentagraph passes over the outline of the photograph thrown on the screen, the cutting tool at the other end cuts the clay into the corresponding outline. The clay is then shifted, one division on its axis, and the next corresponding photograph thrown on the screen, and the operation repeated, and so on in succession till the clay has twenty-four or more outlines accurately transferred to it. It then only remains for the artist to connect these tracings or outlines on the clay, and, here, of course, his skill is shown. The artist thus has a large amount of work mechanically and rapidly prepared for him, and he is enabled, in a comparatively short time, to execute a model combining all the truthfulness of mechanism and the skill of the artist. From this model casts in plaster, or statues in marble, can be taken in the usual way. It is stated that the sculptures thus produced are remarkably good, and can be supplied at a very cheap rate, as compared with sculpture produced entirely by hand.

The Bouquet in Wine.

An experiment, interesting to wine drinkers, has been lately made by M. Bertholet, the celebrated professor. It was he who first discovered that there is a particular oxydable principal in Bordeaux and Burgundy wines to which he attributes their flavor. In pursuing his studies he was induced to examine the influence which oxygen exercises over wine. The result convinced him that this action is most unfavorable, and that it entirely destroys the bouquet, which is replaced by a most disagreeable flavor. M. Bertholet found it sufficient to pass a current of oxygen into the choice wines of St. Jean and Thorin to produce this result, and demonstrate experimentally that a very small quantity is sufficient to destroy the bouquet of a quart of Thorin, and that the absorption of oxygen by wine, accelerated by the elevation of the temperature, is rendered almost immediate by the addition of an alkali.

The observations of this distinguished chemist prove how necessary it is to preserve wine in a perfect state from the action of the oxygen contained in the air, since the prolonged contact of 10 cubic centimeters of oxygen—that is, 50 cubic centimeters of air—is sufficient to destroy the bouquet of a quart of wine. It is to the slow penetration of oxygen into bottles that M. Bertholet attributes the destruction of flavor which every wine experiences at last. The reason that the racking off of new wine from the vat to the cask does not produce a similar result is that new wine being saturated with carbonic acid, disengages a portion of it when exposed to the air, so that it is in a great measure preserved, a very small volume of air disengaging a considerably greater volume of carbonic acid. The decomposition of wine in bottles half full, and the diminution of the flavor, well known to all connoisseurs, are caused by the action of oxygen. The complete destruction of the flavor of wine by the addition of an alkaline mineral water, such as that of Vichy, is explained by the preceding facts.

DEATH OF THACKERAY.

This eminent English novelist died suddenly in his bed some four weeks since,—the precise date has escaped us. The *Times* gives the following account of his last hours:—

"He was suffering from two distinct complaints, one of which has now wrought his death. More than a dozen years ago, while he was writing 'Pendennis,' it will be remembered that the publication of that work was stopped by his serious illness. He was brought to death's door, but was saved from death by Dr. Elliotson; to whom, in gratitude, he dedicated the novel when he lived to finish it. But ever since that ailment he has been subject every month or six weeks to attacks of sickness, attended with violent retching. He was congratulating himself the other day on the failure of his old enemy to return, and then he checked himself, as if he ought not to be too sure of a release from his plague. On Wednesday morning the complaint returned, and he was in great suffering all day. He was no better in the evening, and his servant, about the time of leaving him for the night, proposed to sit up with him. This he declined. He was heard moving about midnight, and he must have died between two and three in the morning of Thursday. His medical attendants attribute his death to effusion on the brain. They add that he had a very large brain, weighing no less than 58½ oz. He thus died of the complaint which seemed to trouble him least. He died full of strength and rejoicing, full of plans and hopes. On Monday last he was congratulating himself on having finished four numbers of a new novel; he had the manuscript in his pocket, and with a boyish frankness showed the last pages to a friend, asking him to read them and see what he could make of them. When he had completed four numbers more he said he would subject himself to the skill of a very clever surgeon, and be no more an invalid. In the fullness of his powers he has fallen before a complaint which gave him no alarm."

COLD WEATHER AND STEAM ENGINES.

During the winter much more care is necessary to preserve steam engines from injury than in milder seasons. Feed pumps are particularly liable to be damaged by frost, and much delay and expense results from inattention to them. Every pump should be provided with a small cock, so that the water could be drawn off every night, and the same should be left open so that no driblets or leaks from the suction or supply pipe could run in and cause damage, as pumps are so situated that this might occur sometimes. A steam cylinder needs a warm coat in winter as much as a man does, and if at no other time of the year, the pipes and all other parts containing steam should be "lagged" or felted heavily, as the loss by radiation is something to be considered. Engineers who pride themselves on a good reputation in small bills for fuel and supplies, should see to it that they do not overlook this matter. It is no argument to say that the engine room is itself warm enough, for this is not so; heat is radiated from all bodies, whether their temperature be the same or nearly the same as surrounding bodies; for it is the tendency of heat to place itself in equilibrium. The strain on a feed pump, induced by freezing the contents, amounts to one-eleventh of their bulk, as water expands in that ratio by freezing. An unloaded shell, it is said, was once filled with water and exposed during a cold day. The hole was stopped with a plug, which was thrown violently out of the shell, when the water froze, to a distance of 400 feet, while a cylinder of ice eight inches long protruded from the aperture. This experiment is one easily tried by our soldier mechanics, and though it may not be entirely successful, it serves to illustrate the force with which freezing water expands. In excessively cold weather, where steam boilers are allowed to get entirely cold over night and are fired up again in the morning, they will soon become leaky; as the constant extremes of expansion and contraction tend to produce that effect. An immense amount of fuel is wasted every year, even with the most careful supervision; but the quantity becomes enormous when little or no care is taken to prevent loss. In the winter this is particularly the case, and some steam pipes are as cold as if they had never had a pound of pressure in them; the result is easily seen at the end of the year.

NEW YORK STATE STATISTICS.

Information of a very interesting character is contained in Governor Seymour's late message. During the year 1863, the total amount expended for common schools was $3,854,900; the total number of children attending during the year was 887,570, out of 1,356,900 persons between the ages of 4 and 21 years. The number of teachers employed is 26,213, in 11,749 school houses; and there are 1,175,335 volumes in the District Libraries.

On the 30th Sept., 1863, there were 309 banks doing business in the State, with an aggregate capital of $109,258,147. Seventeen national banks have been established with a capital of $2,140,000.

About 8,000,000 bushels of salt were made at the Onondago Salt S rings last year, the increase over 1862 being one million of bushels.

The receipts of the general State fund amounted to $7,821,891, and the expenditure to $9,836,291, being a deficit of over one million of dollars.

Appropriations for bounties to volunteers, for sick and wounded soldiers, harbor defenses, etc., amounting to $5,337,000, were made by the last Legislature. Of this, $2,100,000 have been drawn.

The receipts for canal tolls in 1863, were $4,645,095 —a falling off of more than half a million of dollars from those of the previous year. The expenditures for canal repairs and salaries of office-holders, amounted to $4,435,955.

The freight carried on the canals amounted to 5,400,000 tuns; on railroads, 4,720,602 tuns, and the value of property carried on, is estimated at $447,680,000.

Wealth and Population of New York City.

The inaugural message of Mayor Gunther, contains some information of very general interest. New York is the largest city on the continent of America, and the third city in point of population in the civilized world. In 1840 the population was 212,852; value of real and personal estate $252,233,515; taxes levied $1,354,835. In 1850, the population was 515,394; valued real and personal estate $286,061,816; taxes $8,230,085. In 1860, population 814,254; valued real and personal estate $577,530,956; taxes $9,758,507. In 1863 the population was 1,000,000; valued personal and real estate $594,196,813; taxes $11,565,672. The expenditure of New York in proportion to population and wealth exceed those of any other city, and has been for years the source of much complaint. The total actual debt of the city is $19,929,441. There was an increase of debt in 1863 of $1,406,900. But the value of the real estate held by the city and pledged for the payment of the debt, is estimated at $40,000,000. A very large surplus fund is derived from the Croton water rents, and $2,579,534 has passed from this to the sinking fund for the redemption of the city debt.

Blockade Runners.

The commander of a blockade runner usually gets £800 a round trip from Bermuda or Nassau, and the privilege of purchasing twelve bales of cotton for £15 at Liverpool. It is only possible to make one trip during a month from Bermuda, but two could be made from Nassau. The risk to the commander is fearful, as the Federal cruisers are most dangerous to encounter. The instructions to commanders of blockade runners are to sink their ships rather than let them be captured by the Federals. Each blockade runner is well provided with boats, which can be lowered in a moment. These boats are provided with rowing and steerage gear, and with ten days' provisions. When there is no chance for the escape of the ship at night, the crew scuttle her and escape if possible to the boats; before the Federals can board the scuttled ship she is very often water-logged or sunk.—*London Times.*

The English Admiralty have decided that the names of persons serving on any rebel vessel who belonged to the Naval Reserve shall be stricken from the list, forfeit all privileges, and not be allowed to re-enter the service.

Foreign Cotton.

Messrs. Mill & Bros., of Manchester, England, calculate that the cotton supply from all sources for 1864 will be about 2,825,000 bales, giving for consumption 51,100 bales weekly. It is expected that India will supply about 1,800,000 bales. The high price of cotton has stimulated its cultivation in many countries where it was formerly raised in very small quantities. If the present war was over, and cotton cultivated in the Southern States at as low prices as formerly, India, Egypt and other cotton countries would scarcely be able to withstand the competition, and the United States would again become the cotton garden of the world.

MISCELLANEOUS SUMMARY.

Metallic Flags.—Mr. A. Watson, of Washington, D. C., has recently introduced a new metallic flag, which is highly spoken of by those who have seen it. The inventor says;—"These flags are more beautiful than bunting, or even silk; and as they cannot be injured by the most violent storms of wind, rain, snow, or sleet, they will in the long run be twenty times cheaper than bunting. They will also answer the double purpose of a flag and a vane, and may be used as a sign. They are always thrown to the breeze, wind or no wind, and are literally nailed to the mast."

Cost of Cultivating Land by Steam.—A Mr. Smith, of Woolston, England, has published an account of the cost of cultivating land by steam for eight years, in which he says that the cost of preparing land for roots was, with steam, $2 88; with horses, $10 3; for barley two years, $2 16 with steam against $5 5 by horse power; four years for wheat, $50 20 by steam against the same for horse power, and foots up a total for a number of other articles, which shows a gain of 200 per cent in favor of steam. The writer says also that besides the economy of the plan he had much better crops.

Steamboat Accidents.—The number of persons who lost their lives or were wounded by steamboat accidents in 1863 was 255 killed and 85 wounded; but although this is an increase of such accidents over the previous year, it is pleasant to record that the number is small in comparison with most former years. Thus, ten years before, in 1853, there were 319 killed and 158 wounded, and yet steamboats have greatly multiplied since then. In 1860, there were 579 lives lost and 134 persons wounded. Steamboat traveling in the United States is becoming far more safe.

A Novel Spectacle.—New York is a great place for sight-seeing. Passing up Broadway one day last week we saw a crowd of about fifty respectable-looking men surrounding an object that lay stretched upon the ground packed in blankets. Upon inquiring into the cause of the excitement from one of the bystanders, we soon ascertained that it was caused by an old gray horse, who was just breathing his last. Such scenes of attraction are now quite common in New York.

The Montauk nation of Indians, once one of the most powerful in America, has dwindled down to five persons. Their monarch, or the monarch of four of them, Sylvester Phare, keeps no standing army, the smallness of his revenue obliging him to dispense with that kingly luxury.

Great Steamship Speed.—The steamship *Scotia*, of the Cunard line, on her late passage from New York to Liverpool, made the quickest Atlantic trip on record. From New York to Queenstown, Ireland, the passage was but eight days. To the Mersey the time was but eight days and 21 hours, including stoppages.

The new French journal, *L'Æronaute*, which made its appearance a few weeks ago, is devoted to aerial traveling; its first part being ornamented with a very extensive engraving of balloons, parachutes, flying machines and other similar inventions.

The number of steamers inspected in the United States during the last fiscal year was 933, with a tunnage of 405,000 tuns. The number of engineers licensed was 2,700. The number of boilers reported defective by the inspector was 55.

The government employes at Sheerness, England, who assisted in fitting out the *Rappahannock* for the rebels, have been discharged for violation of the neutrality law.