

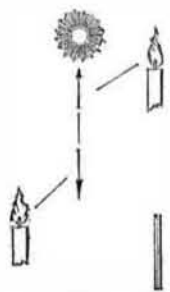
Imponderable Agents.—No. 4.

[Second Series.]

LIGHT—UNDULATORY THEORY.—The Abbe Moigno, of France, author of an excellent work on telegraphs, and editor of a scientific periodical (*Cosmos*) Paris, has published a paper on his experiments with Nobert's plates, which fully confirm the undulatory theory. "M. Nobert," he says, "a German optician, has succeeded in tracing upon a surface of polished glass, perfectly parallel lines, the distance apart of which is only the five-thousandth of a millimeter (0.00008 inch) the length of a wave of light, and has desired to make his marvellous skill subservient to the triumph of the undulation theory. For this purpose he has executed three plates, which were sent to us by M. Albert, of Frankfort. We immediately appealed to the optical resources of M. Jules Duborg, and the skill of M. Natchet in microscopes, and with the German instructions in hand we repeated the fundamental experiments; they have fully satisfied us; they are the true touchstone of the optical theories.

In the center of a quadrangular strip of glass are traced seven groups of equi-distant parallel lines; the lines of each group are equally spaced; the different groups are separated from each other by a greater interval; in passing from one group to another, the distance of the lines apart augments, and the seven distances are proportionate to the wave-lengths of the seven principal colors of the spectrum; violet, indigo, blue, green, yellow, orange, red; the following are the distances expressed in millionths of a Parisian line; 1st group, violet, 900; 2d, indigo, 1000; 3d, light blue, 1075; 4th, green, 1188; 5th, yellow, 1325; 6th, orange, 1450; 7th, deep red, 1,600.

When these seven groups have been traced upon the plate, it is covered with a very thin protecting slip with parallel faces, and there is engraved upon this slip with the point of a diamond, a star, a double arrow, and a double candle with its flame, as is shown in the accompanying figure.



To observe, we take a microscope magnifying from 16 to 27 times; if the lenses have not, like those of the French microscopes, a very small diameter, a small disk of blackened metal pierced with a small hole, is placed in the mounting of the objective; the plate is placed on the table of the microscope, with the arrow pointed towards the light (the best of all lights is that from a white cloud); between the mirror and the light is erected five or six inches from the mirror, a screen pierced with a horizontal slit six inches long and one-third of an inch wide, which throws the light upon the side of the mirror corresponding to the flame engraved upon the plate; while looking through the eye-piece, the mirror is gently turned, and soon seven colored bands or seven flat or uniform tints appear in the field of vision, representing the seven colors of the solar spectrum separated by dark very distinct and very brilliant intervals. The plate may be placed in two different ways on the table of the microscope; with the protecting plate either above or below. In the first position, the interferences which produce the colors, evidently take place in the sheet of air between the plate and its cover, and the spectrum produced may then be called the air spectrum; in the second position, the interferences take place in the glass, and the spectrum is the glass spectrum. Now, observation shows that these two spectra are completely identical, that the colors are exactly the same, as they ought to be according to the theory of undulations, which thus receives a simple and striking confirmation.

COLORS.—It is very different to explain the phenomenon of black bodies; strictly speaking, there may not be a black substance in nature.

If we take a pen and make a single black line with ink upon a sheet of white paper, and then examine that line through a common magnifying glass, no black line can be seen, but instead of it three bands of color, comprising the three primitive colors in a ray of light. Figure 2 represents this phenomena, the right line is a deep indigo blue, at the side of it is a light blue band, on the other side is the red, and on the other the yellow ray. Any person can perform this experiment, and by the aid of a pen, a sheet of paper, and a magnifying glass, behold all the colors of the rainbow displayed by a line of black ink. Every black line, on a printed card, having a white ground, if viewed through a magnifying glass glows with all the beautiful hues of the solar spectrum. Sir Isaac Newton's philosophy of colors comprised seven distinct colors in a ray of light; but Dr. Hay, of Edinburgh, or Sir David Brewster (the credit, we are told, should be divided among them) made the discovery in 1823, that there were only three colors in a ray of light, namely, blue, red, and yellow. Practical men knew long before this fact was announced, that there were only three primitive colors in nature, and the writer of this, before ever he saw Brewster's account of the matter, was well acquainted with the fact. A black body appears to nullify the rays of white light, not absorb them, or else it should become luminous. In all likelihood the effect of a black color (it is convenient but not philosophical to call *black* a color) in a body, is caused by the fineness of the subdivided parts of the body; this is the opinion of Prof. Horsford as set forth in his paper read before the American Association for the Advancement of Science. Be that as it may, a black color can be produced, by the primitive colors of a ray of light being made to over-lie one another. Thus if a piece of fine white woolen cloth be dyed a deep yellow in a bath of quercitron bark; then dyed on the top of the yellow a deep red, in a bath of cochineal; then dyed on the top of the red, a deep blue in a bath of the hyposulphite of indigo a beautiful black will be the result. The piece of cloth must be well washed out of every bath; the chloride of tin is employed as a mordant for the yellow, and tartar and the chloride of tin is employed as a mordant for the cochineal. Silks and woollens of a yellowish color are whitened by passing them through baths containing a dilute solution of red and blue coloring matters. The method here described of producing a black on woolen cloths may be valuable to many of our readers. Scarlet and red cloth can be changed into jet and blue black by simply boiling them in a bath of *chemic*—hyposulphite of indigo. The exact quantity to use cannot be given; care and a little experience will enable any person to use the proper quantity for any amount of goods.

Rotary Winds.

It is well known that there has been considerable disputation among scientific men respecting the correctness of Prof. Redfield's theory of rotary hurricanes. The "Salem (Mass.) Register" contains the statement of Capt. Upton, of the bark "Argentine," which appears to have a bearing upon this theory of storms, and will be interesting to the scientific world:

"On the 25th of November, latitude 26° N., longitude 60° 30' W., the wind being S. S. W. at the time, the barometer commenced falling very rapidly, near sunset, and continued to fall till it went as low as 29 inches. Being satisfied that we were in the vicinity of a hurricane, we began to shorten sail immediately; and, at midnight hove to, head to the westward, under close-reefed maintopsail—blowing very heavily, accompanied with the most vivid flashes of lightning from every part of the horizon, without intermission—so much so that the whole heavens appeared one vast sheet of flame. At noon of the 26th took in maintopsail—barometer rising to 29.80—the wind backing round to N. W. by the eastern board.

At midnight wore ship to W. S. W., set the close reefed topsails and foresail, weather still moderate—almost calm—till 4 A. M., 27th, when the barometer began to fall, as before, till it again went to 29. Took in the topsails and foresail, and hove to under main spencer and a tarpaulin in the mizzen rigging—blowing

with inconceivable fury. The sea was thrown into the most violent agitation, on account of the rapidity with which the wind changed, which caused it to tower up in a conical shape truly terrific! The wind continued to haul to the southward till the morning of the 28th, when it again reached S. S. W., the point from whence it started—thus making a complete circuit of the compass. It now began to moderate, the barometer remaining the same, and being fully convinced that we had passed from the southern edge to the center, where we were becalmed, and that by continuing our course N. W., we must again cross its track, I thought it advisable to keep the vessel's head to the southward—as recommended in Prof. Redfield's treatise, and making sail stood S. E. thirty miles, when the mercury began to rise immediately and it cleared up. Had we not pursued this course, I am satisfied that we should again have encountered the hurricane in all its fury.

During the heaviest part of the storm, the mercury "danced up and down" in the barometer three-tenths. The circular or rotary course of this hurricane is palpable enough to convince any one of the soundness of the theory which I believe Prof. R. was the first to promulgate.

[The rotary theory of storms we believe is correct. We know that all the severe storms which take place around New York are rotary. To this we have paid particular attention during the past few years, and have never seen it fail in a single instance. There is one other feature about the storms which take place in this vicinity and which demands more attention, namely, severe storms most generally take place during the hours of night. It commences to blow generally between 7 and 8 P. M., and continues more or less violent during the whole night, then moderates when the day dawns.

Electric Gas.

The proverb says, "There is nothing new under the sun;" we have been led to doubt the truth of this from having witnessed a private exhibition of "electric gas." That is, gas produced from water by means of electricity, and by which is developed, for the first time, the extraordinary phenomena of burning the two gases together, without the least fear of explosion, which the most scientific and learned of men have ever hitherto deemed an impracticability.

The gases produced by electricity are free from all possibility of explosion. Its production requires no expensive materials, nor are large premises necessary, whilst all existing pipes and lamps may be used if requisite; and in the economy of production there will be a saving of at least 50 per cent. upon the present cost of coal gas.

Mr. Gamble, a scientific gentleman connected with gas works and railways, has made a report on this electric gas, in which he says:—

"I cannot find language sufficiently expressive to convey the astonishment I experienced at witnessing the effects of the electro-magnetic machine in the production of gas applicable for the purpose of artificial light and heat by the decomposition of water. Water is found, on a chemical analysis, to be composed of two permanently elastic fluids, or gases called oxygen and hydrogen. When water is decomposed, an enormous increase in volume is the result; this increase is about 2,000 times. It has been long known that water is decomposable by electrical agency, but this has been generally effected by the action of a galvanic trough, at an expense so great as to be commercially prohibitory. But by the magnetic apparatus the expense is very trifling, being little more than interest on first cost of the machine, with a small addition for renewals, and the cost of the motive power. The decomposition of water for the purpose of obtaining a gas applicable for the production of artificial light and heat, has long engaged the attention of chemists, and numerous discoveries professing to attain this desideratum have been made. All these, (so far as I am acquainted with them) have for their object the separation of the hydrogen gas only; no attempt, I believe, has hitherto been made to make use of the ox-

xygen. The general mode in which the hydrogen is obtained is by passing steam through scrap iron, or a variety of other materials heated to a high temperature; in this manner the vapor of water is decomposed, the oxygen unites with the heated solid body, and the hydrogen is liberated in the gaseous form, and collected in a gas holder. But the gas resulting from the decomposition of water by the magnetic machine is altogether different. Here is collected not merely the hydrogen, but the oxygen also; this increases the volume of production one-third, and the gas is altogether different in its composition.

It is an invention, the most gigantic of the age of wonders."—[London Mining Journal.

[The above is a very long quotation, and we would not republish it unless we thought of accomplishing some good thereby. We will therefore point out the errors contained in it, and show the utter unscientific qualifications of its author, who is reported to be "a scientific gentleman." And we do this as a duty, because we have seen the above republished in many of our exchanges, and we certainly do not wish nonsense to go abroad uncorrected under the panoply of science.

It is well known to almost every child in our land, that water is composed of hydrogen and oxygen; and when decomposed into these elements, they increase in bulk about 2,000 times their volume—as water. But it is not true that water has generally been decomposed heretofore, by passing steam through red hot scraps of iron, by which process the hydrogen is set free, while the oxygen unites with the metal. Zinc and iron, submitted to the action of dilute sulphuric acid, will generate hydrogen by decomposing the water; but platinum heated to a white heat, if plunged into water, will set both its oxygen and hydrogen free.

But water has been decomposed into its elementary gases, many times by the very plan set forth above, namely, electricity. This was Paine's plan of decomposing water to obtain his light. It is more than twenty years since this was first done by the Magneto-Electrical machine of Mr. Saxton, a scientific American residing in London: he accomplished the very thing said now so be "the most gigantic invention of this age of wonders," and in the very city where the above affair has been thus unblushingly announced by a *scientific gentleman*.

In 1838 Dr. Page, formerly of the Patent Office, made a great improvement on the Magneto-Electrical machine, by which powerful currents were generated, perfectly applicable to the decomposition of water.

The gases of water are not fit for illumination, unless burned on lime or chalk, forming the Drummond Light. This light is very expensive and troublesome. The gases of water cannot be conveyed and used in pipes like our common carburetted hydrogen, nor can they be used with safety. A jar containing hydrogen and oxygen in the proportions for forming water, will explode with great violence if a spark of electricity be passed through it—these gases will also explode if a light of any kind be applied to them.

The statement above, that the gases of water "are free from all possibility of explosion," is an unqualified untruth, and so is all that is stated about its cheapness of production. These gases can be safely burned by well-known apparatus made for the very purpose, still they are dangerous. They produce, when burned, an intense heat; a heat so great, indeed, as to melt platinum like wax, by Dr. Hare's blow-pipe, but unless burned upon lime or some solid incandescent substance, as we have already stated, they will produce only great heat, but not good light. In the above extract which we have quoted, there is nothing new except that which is *untrue*.

Fine Cotton.

The Augusta (Ga.) Constitutionalist chronicles the sale in that city of a lot of 17 bales of cotton at 11 cents per pound. It was from Oglethorpe county. We have a higher figure than that, and in Georgia cottons also; two hundred bales from Green county were sold at 12 cents; the cotton was very superior, both in color and staple.