struck, it has invariably been proved that the rod was in defective condition; and defects in this regard are more common than is generally suspected. Professor Maxwell goes on to state what, according to his ideas, would be required to prevent the possibility of a discharge within a certain region. Take for instance a gunpowder manufactory. He says that it would be sufficient to surround it with conducting material, to coat the roof, walls, and ground floor with thick sheet copper, and make no earth connection. He even proposes to isolate the building and its contents with a layer of asphaltum. He says that if the building were struck it would remain charged, and that a person standing on the ground outside, and touching the wall, might receive a shock, but that no electrical effect would be perceived inside the building. We need hardly say that the execution of such a proposal would be so expensive as to make its practical application objectionable on account of the cost; but we must point out that the arrangement would lack one of the main virtues of a good lightning rod, namely, the gradual and silent discharge of atmospheric electricity, and also that from thunderclouds, thus making explosive discharges less destructive, if not preventing them entirely. It would appear that Professor Maxwell wishes to prevent this discharge, and desires to charge the isolated gunpowder magazine with the electricity of the cloud; but he forgets the vicinity of the conducting earth under the layer of asphaltum. The surface of the earth always becomes charged by induction when an electrically charged cloud is over it; and if, according to Professor Maxwell's proposition, the powder magazine were isolated, and charged from the cloud, it would only serve to make the induced charge of the earth's surface stronger in proportion as the powder magazine is nearer to the earth than to the cloud, of which, electrically speaking, the powder magazine would become a part. If there were no connection between the cloud and the magazine, layers of dry air intervening, the powder magazine, being placed between the negative earth and the positive cloud, would not have its charge equally distributed, but its floor would have an excess of positive electricity, and its roof an excess of comparatively negative electricity. If a better communication, by means of moist air, were established with the cloud, so as to neutralize the negative electricity and charge the whole powder magazine with positive electricity, the danger would be of a different nature. Having the same charge as the cloud, and being, as we have stated, a part of the same, its antagonist is now the earth; and a discharge between the gunpowder mill and the earth, through or along the asphaltum isolater, is now to be feared, changing suddenly the electric condition of the magazine. We ask if this may not be undesirable, or even dangerous? Certainly, if this be considered an open question, it will be more safe not to run the risk.

Professor Maxwell goes further on to state that it is unnecessary to connect large masses of metal, such as engines, tanks, etc., in the building. But if any conductors communicating with outside objects, such as gas or water pipes, telegraph wires, etc., enter, they must be connected. This is a very curious statement. What now becomes of the isolation, on which, according to Professor Maxwell, the safety principally depends? If the gunpowder mill be connected with the earth, it can no more be charged like the cloud, but will, by induction, possess the opposite electricity, and the chances of explosive discharge will be made much greater. The greater or less danger from such explosive discharges depends entirely on the degree of perfection of the ground connections; these may be good enough to draw slowly the negative electricity from the ground, induced by a positively charged cloud floating over the building, which would also charge the building strongly by induction; but these very connections may be utterly inadequate to discharge suddenly a large quantity of electricity flashing from the cloud to the building: in which case the current is not confined to the lightning rod, but takes an additional path, any that it can find, and so does the damage. Professor Clerk-Maxwell says, further, that no telegraph wire from without should be connected with nor enter a powder mill, as it would make the telegraph useless; we would add another important reason—namely, that sparks of atmospheric electricity entering the mill by telegraph wire, as they often do telegraph offices, would be dangerous visitors.

In order to avoid the expense of covering a whole powder mill with sheet copper, the Professor finally suggested surrounding it with a network of copper rods, one fourth of an inch in diameter, the rods passing round the foundation and up each of the corners and gables, and along the ridges. He also proposes to build the copper wire in the wall to prevent theft, and recommends that it be connected with all metals on the outside of the house, such as sheet lead, rainwater pipes, etc., and also with the gas and water pipes in the building; but if these be not present, he says that there is no necessity to take any pains to facilitate an escape of the electricity into the earth; neither is it, he thinks, advisable to erect a tall conductor with a sharp point, to relieve the thunderclouds of their charges.

Now with all respect to Professor Maxwell, we must remark that all this is a mere rehash of a very old discussion on a question which was thoroughly ventilated and disposed of some seventy-five years ago, as will be found on reference to Gilbert's "Annalen der Physie," volumes VIII. and IX., wherein is described a controversy between Professors Wolf, of Hanover, and Reimann. Professor Wolf attacked the then increasing notion that tall conductors with sharp points were needless and even dangerous; the latter defended their use, and attempted to prove their effectiveness on the basis of experience and observation, as well as on theory. In reading over this instructive discussion, we cannot help being struck by the fact that, with all our progress in the science of dynamic electricity, and its applications to telegraphy, electro-plating, artificial light, etc., we know little more of static electricity than we did seventy-five years ago: while our forefathers' heads were clear on the subjects of static and atmospheric electricity, more so than those of our present professors, and much more so than the heads of our modern lightning rod men, who, by their lamentable ignorance, have done much to bring lightning rods into disrepute among many classes.

THE BLUE GLASS DECEPTION.

In our last issue, we reviewed the alleged capabilities of sunlight filtered through blue glass, in causing plants to grow, etc.; and by reference to numerous experiments, we reached the conclusion that the light transmitted through the violet-blue glass is nothing more than normal sunlight diminished in intensity. We propose in the following to finish our discussion by examining into the effects of light and darkness upon organisms. And we may especially here recall the fact that General Pleasonton claims that not only does the blue light stimulate growth, but that it is a positive remedial agent for such severe ailments as spinal meningitis, nervous irritation and exhaustion, rheumatism, hemorrhage of the lungs, deafness, partial paralysis, shock due to severe contusion, and others, of all of which he cites cases.

The theory that various colored lights exercise different effects on the human system is an old one. In 1831, Dr. Newbery of this city asserted that yellow light stimulates the nervous, pink the nutritive, and blue the locomotive temperament; and recently Dr. Ponza, an Italian physician, has asserted that lunatics are greatly affected by being placed in different colored rooms. Red light, Dr. Ponza says, removes feelings of depression, blue induces calmness; and by violet light a crazy person was in one day cured.

It is a thoroughly demonstrated fact that light is an important vital stimulant; and that, if its operation be excluded, the development of the healthy bodily structure is arrested. Naturalists tell us that in the absence of light the transformation of a tadpole into a frog is stopped, and the reptile remains a tadpole. Plants in darkness become blanched and stunted in growth; the process of fixing the carbon in their tissues is arrested, a modification of the coloring principle takes place, and they appear white instead of green. The sad effects of deprivation of sunlight are especially observable among those who live in crowded alleys or cellars, or who work in mines, where the light of the sun seldom or never penetrates. The total exclusion of the sun's beams produces an impoverished and disordered state of the blood, emaciation, muscular debility, and the diseases due to imperfect nutrition.

On the other hand, it is known that for certain purposes darkness or shaded light is advantageous to the bodily condition. Fowls, for instance, may be fattened much more rapidly in the dark, and it would seem that the absence of light exercises a very great influence over the power possessed by food in increasing the size of animals. It likewise seems to exercise a soothing and quieting influence, increasing the disposition of animals to take rest, making less food necessary, and causing them to store up more nutriment in the form of fat and muscle. Now, if the organism to be treated is subjected to light, all of which is filtered through blue violet glass, then, as we have previously demonstrated, it is in light which is considerably shaded. And very probably to this cause—and not at all to the peculiar hue of the light—is to be attributed the quieting influence on nervous and insane people which Dr. Ponza has remarked.

But General Pleasonton does not use blue-violet glass alone. On the contrary, he employs a combination of blue light and pure sunlight, the latter very much preponderating. In his grapery, for example, only every eighth row of panes is blue. The mingled light consequently is merely pure sunlight, very slightly shaded; and the animal or plant exposed simply takes a sun bath—the *solarium* of the ancients, who, knowing the vivifying influence of the sunbeams, had terraces built on the tops of their houses so that they might bask in them. This sun treatment is now frequently recommended by physicians for nervous diseases. Dr. Hammond, in one of his lectures, says: "In convalescence from almost all diseases, it acts, unless too intense or too long-continued, as a most healthful stimulant, both to the nervous and physical systems. * * * The delirium and weakness, by no means seldom met with in convalescents kept in darkness, disappear like magic when the rays of the sun are allowed to enter the chamber."

To recapitulate in brief, General Pleasonton's claims, of any superior powers for blue glass on account of the color which it produces in transmitted light, are, when tested by the result of previous investigations, unfounded. In some instances, where it is desirable to reduce the intensity of the light, blue glass may be used; but any other mode of shading the light, as by ground glass, thin curtains, etc., would without doubt serve equally as well. The cures produced are ascribable to two causes: first, to the healthy influence of the sun bath, and secondly, to the very powerful influence of the patient's imagination. There are abundant cases known where imagination has so powerfully affected the body as to cause death.

Experiments upon criminals have shown that in one instance, where a person was placed in a bed which, he was informed, had just been vacated by a cholera patient (but which had not), he exhibited all the symptoms of that disease. Another person is reported to have shown all the signs of collapse from loss of blood, from the suppositious idea that he was bleeding to death. As regards the animals fattened under the glass, all the circumstances go to show that the result was due to their enforced quiescence, their shelter from the weather, and their free exposure to the sun.

It is hardly necessary to add that in our opinion the use of blue glass, as advocated by General Pleasonton, is devoid of benefit.

HOW WE ARE ABLE TO DO IT.

Hitherto the price of technical publications, especially in the departments of mechanics, engineering, and the chemical arts, has been relatively very high, and for good reasons. The original cost of such matter is usually many times greater than for matter of a purely literary character; the tables and engraved illustrations are expensive; the market for technical works is limited, and their sale for the most part very slow. Consequently it has been impossible for publishers to offer such works at anything like the price at which ordinary works of the same size would afford a profit.

The actual cost of each copy of an edition of a technical treatise may be, say, ten dollars, four fifths of which will have gone for composition, engravings, etc., before the work is put upon the printing press; the other fifth will cover the cost of paper, printing, binding, and the author's pay. If the sale of the work is at all slow or doubtful, the publisher will have to charge from fifteen to twenty dollars a copy to get his money back. But if, instead of an edition of a thousand copies, it is possible to sell promptly ten, twenty, or fifty thousand copies, the cost of each volume will be very materially reduced. While the smaller element of the cost remains substantially unchanged, the larger will be distributed over ten, twenty, or fifty times as many copies, the share for each being proportionately reduced. In other words, the first cost of each copy will be not two dollars *plus* eight dollars, but two dollars *plus* eighty cents, forty cents, twenty cents, or even less, according to the number sold. Hence the publisher can afford to sell the work for very much less than fifteen dollars—perhaps for half what each book would have cost him in an ordinary edition. The same conditions hold good in all cases, whether the first cost be ten dollars or one dollar, the essential factors in determining cheapness being large editions and a ready sale.

Still another and often very important reduction in the cost of printed matter, technical or other, can be effected by choosing a form economical for printing, and a more compact yet still legible type; and by dispensing with cloth or other binding, a further very considerable saving can be made. Given, then, a form of publication like the SCIENTIFIC AMERICAN and a large circulation, it is easily possible to furnish, as we do each year, an amount of valuable and timely matter, many times greater than could be afforded for the money through the usual channels of the trade.

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