A Railroad on Ice.

The communications between the two shores of the St. Lawence River at Montreal are made, as is known, by means of the Victoria tubular bridge, constructed some thirty-five years ago, which is the longest in the world, the metallic span being 6,500 feet long.

But from this point to the Atlantic, for a distance of 1,000 miles, there is no other bridge, and all the railroads established on both sides of the St. Lawrence have necessarily to cross it. The company of the Grand Trunk Railroad, which built it, levies a right of way toll of $10 per car and eight cents per passenger. To avoid payment of these moneys the S. E. Railway Co. had the idea, some ten years ago, of constructing in winter a communication between the two shores by means of a railroad established *on the ice*. Every winter the work is done over again, and it amply pays for the outlay. The length of this ice road is about two miles, between Hochelaga and Longueil. The roadway is easily built. The track leaves the main track parallel to the shore, then curves gradually in such a manner as to be perpendicular to it, and then, again, before it strikes the other shore, it curves anew so as to become nearly parallel to the opposite side, and then it is connected with the main track on this shore. Mr. Senical, the engineer of the line, constructed it as follows: Pine timbers, about 10 by 12 inches, and from 16 to 25 feet long, are placed like ties on the rough surface of the ice, being blocked so as to be horizontal in a direction perpendicular to the roadway by means of blocks of ice, and according to whatever grade may be adopted in the longitudinal props.

These long cross ties are placed at about 7 feet 3 inches from center to center, and they receive two parallel lines of longitudinal timbers of the same dimensions, 10 by 12 inches, distant also from each other in the length of the track of 7 feet 3 inches. Over these longitudinal ties, or stringers, and perpendicular to them, are placed, in the usual manner and at the ordinary distance from each other, the small cross ties used in railroad construction, to which are spiked the rails as it is customary. In this manner the rails are laid on a sort of crib, about 30 inches high above the level of the ice. No spokes, no joints of any kind, are used to fasten timbers or ties together, every piece of timber being merely laid down and blocked to its proper position or level with ice blocks. The whole crib is then filled with broken pieces of ice up to the level of the bottom of the rail, and this kind of ballasting is even made to project beyond the ends of the first timbers laid at bottom. Holes having been dug through the ice surface, the water of the river is pumped over the whole, and, in twenty-four hours or thereabout, a perfectly solid and compact track is obtained, over which trains can run. The thickness of the ice of the river in winter in these latitudes is never less than 16 inches, and this does not include the ice ballasting of the tracks. It is much more, if we refer ourselves to the preceding experiments, than is required to support any charge which can be placed upon it, specially if we consider that, from this mode of construction, each lineal foot of track corresponds to at least twenty-five square feet of ice to bear the load it may have to support. The same timbers can be used, of course, the following year.—*Ice and Refrigeration.*

Bright Streaks on the Full Moon.

In *Astronomische Nachrichten*, No. 3111, Professor Pickering gives a brief condensed account of the investigation that has been carried out at Arequipa with regard to the systems of bright streaks, especially round prominent craters, that are visible on our satellite at the period of the second and third quarters. The instrument employed was the 13-inch, and the magnification ranged from 450 to 1,120 diameters. The chief results noted were: (1) That the streaks of the systems round many of the large craters are not oriented to the center of the prime crater, but toward other craters whose dimensions are considerably smaller. (2) These minute craters are extremely brilliant, and rarely exceed one mile in diameter. (3) Some streaks are found to lie across or upon ridges; these are very seldom connected with small craters. (4) In the case of Copernicus, streaks are found to start from craterlets inside the rim and low up the inner side of the walls, and down the other side. The rim of Tycho also contains similar craterlets, but the streaks do not extend very far. (5) A difference in color was noticed between the streaks systems of Copernicus, Kepler, and Aristarchus, and those of Tycho, the last mentioned being considered whiter than the others. (6) There are no very long streaks; their general length may be reckoned from ten to fifty miles. What have been previously taken for long streaks are found, by minute observation, to be simply a series of these smaller ones connecting up, apparently, many small craters. That extending from the regions of Tycho across the Mare Serenitatis is so constructed. In seeking an explanation to account for the origin of these bright streaks, Professor Pickering suggests that if, for example, the craterlets on the rim of Tycho were constantly emitting large quantities of gas or steam, which in other regions was being absorbed, "we should have a wind uniformly blowing away from that summit in all directions." Should other craterlets in the vicinity "give out gases mixed with any fine white powder, such as pumice, this powder would be carried away from Tycho, forming streaks." This hypothesis, besides explaining the presence of the streaks themselves, satisfies very well the fact that they can only be seen after and before the first and last quarter of the moon phase, for it is only at this time that the contrast would be best seen.—*Nature.*

SCIENTIFIC NOTES.

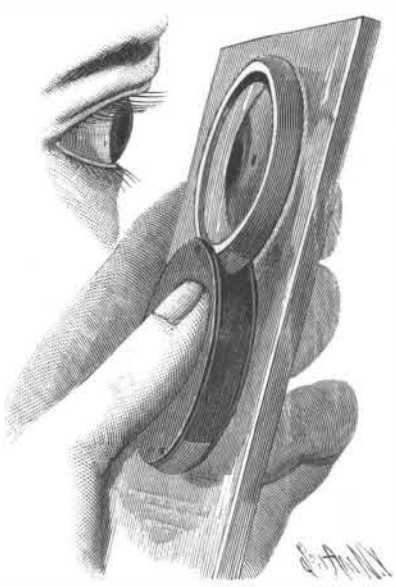
BY GEO. M. HOPKINS.

REMOVAL OF FOREIGN BODIES FROM THE EYE.

When a cinder, a piece of rock, steel, or other foreign substance gets into the eye the sufferer is desirous of being relieved as quickly as possible, not only on account of the pain and discomfort, but also on account of the apprehension of the object becoming more and more deeply embedded in the tissues, and the production of serious inflammation which accompanies any intrusion of this kind, and which is likely to last for some time after the removal of the foreign substance.

We are usually averse to allowing any one to meddle with our visual organs, especially when it involves anything akin to a surgical operation, so that if we can help ourselves when we meet with a misfortune of this kind, it is our pleasure to do so.

When the object is of such a size as to be readily visible in an ordinary mirror, persons with normal eyesight can easily locate it, and, in ninety-nine cases in a hundred, can remove it without aid by using a finely pointed pine stick, the extremity of which is moistened and bruised between the teeth sufficiently to destroy its rigidity and make it brush-like at the very point. Often the foreign body is so minute as to be undiscoverable by the means named, or the vision may be such as to necessitate the use of spectacles. In either of these cases the ordinary mirror will not answer; a concave or magnifying mirror is needed. This will show the object without using spectacles.



MAGNIFYING GLASS AND PLANE MIRROR USED AS A SUBSTITUTE FOR A CONCAVE MIRROR.

When the foreign substance consists of finely divided particles such as sand or dust, a wet camel's hair brush may be used to advantage. When the substance cannot be removed in either of these ways, the services of an oculist should be secured as early as possible. If the magnifying mirror is not available, a pocket magnifier having a diameter of 1 or 1¼ inches and about 2½ or 3 inch focus may be used in connection with an ordinary mirror, by placing the magnifier in contact with the face of the glass, as shown in the engraving.

AID TO VISION.

When age creeps on and vision fails so that eye glasses are essential to the close examination of near objects, it is vexatious when a person dependent on eye glasses finds his glasses have been left or lost just when they are needed most. If the light is strong, the angle of vision may be increased as the angle of the photograph lens is increased; that is to say, by the use of a diaphragm. The reading or seeing is to be done through a pinhole in a card, or better, in a piece of thick tin foil. The perforated card must be placed as near the eye as possible to secure the best results. It is not supposed that this device will take the place of glasses, but as a makeshift in an emergency it is valuable.

STOPPING LIGHT WITH TRANSPARENT GLASS.

One bright day, not long since, a reader of the SCIENTIFIC AMERICAN astonished a glazier by placing a few sheets of clear glass in such relation to each other as to almost entirely prevent light from passing through them, although the same panes of glass when piled together parallel with each other allowed objects to be clearly seen through them. This is how he did it. He placed 8 or 10 sheets parallel with each other and arranged them at an angle of 35° 25′ (the complement of the polarizing angle) with a given plane. Then he placed a similar bunch of the plates at the same angle with the plane at right angles to the first. In the first bunch of plates about one-half of the light was reflected to one side, while the remainder, which was polarized, passed on and was practically extinguished in the second bundle of plates.

A LESSON IN COMPLEMENTARY COLORS.

A gentleman whose power of observation is active recently retired in a room having white walls and ceiling and furnished with yellow window shades which were drawn down. He was awakened in the morning by the sunlight pouring in through the yellow shades. The walls and ceiling of the room appeared to him to be of a light green color. His explanation of this phenomenon was this: The light in passing through his eyelids was tinted red; by continual exposure of the optic nerves to red light they became tired, so that when the red screens (the eyelids) were removed by opening the eyes, the sensation of the complementary color was experienced, and as a result, the walls and ceiling appeared green. After gazing at the ceiling until the green color had vanished, he closed his eyes and covered them to prevent light from entering through the lids, when a vivid purple, the complement of the yellow or orange shades, was seen.

Hamburg Water.

BY JOHN B. COPPOCK, F.C.S., ANALYST TO THE LONDON WATER CO.

The spread of cholera at Hamburg has been one of the most noticeable points in the present cholera scare.

The connection between cholera and its diffusion in a polluted water medium has been strengthened and developed by many remarkable outbreaks extending over the last thirty years. The ravages of the disease have been shown to be coincident in time and space with the use of water from impure wells, the introduction of a pure and fresh supply bringing about the abatement of the outbreak.

Whether cholera can be produced by animal organic matters not of a specific nature has not yet been proved, but it has been proved that a polluted water supply is a splendid medium for the propagation of the cholera poison; anyhow, the endemic area of cholera approximates very closely to the area supplied with a polluted water.

By the kindness of a friend I have been enabled to get a sample of Hamburg water, taken from the mains by an ordinary tap, just as it is supplied for drinking purposes to the houses. The water gave the following results:

PHYSICAL EXAMINATION.

Appearance	Turbid, very yellow.
Taste	Slightly unpleasant.
Odor	Extremely small.
Deposit	Small, dirty looking.

MICROSCOPIC EXAMINATION.

Animal and vegetable matters ... Inorganic particles.

QUANTITATIVE RESULTS (MEAN OF TWO ANALYSES).

Total solids	81·25	grains per gal.
Chlorine	33·04	"
Free ammonia	0·0746	"
Albumenoid ammonia	0 0205	"
Sulphates	2·37	"
Nitrates	1·95	"
Oxygen (consumed in 15 mins.)	0·065	"
" (consumed in 4 hours)	0·24	"

Cultivation in nutrient gelatine produced the usual crop of bacteria, bacilli, micrococci, and fungi, but the consumption of the water has not produced any choleraic symptoms in a cat. The water is very likely not specifically polluted, it producing a lowered state of the system and tendency to diarrhœa, favorable to the specific contagion. As the water is originally taken from the Elbe, it may with fairness be described as little short of "dilute sewage." The Senate of Hamburg is going to be asked to authorize the immediate construction of artesian wells for the production of a pure water supply—not too soon to take such steps in the present condition. A better water supply might have saved Hamburg from the present epidemic.—*Chemical News.*

Colors from Metals.

A thin, reguline, and coherent film of a metal transmits light of a color remarkably similar to that emitted by its incandescent vapor. The color of the vapor of a metal varies with the temperature. Just above its boiling point the vapor of sodium is purple; at incandescence, yellow. The vapor of potassium is green; at incandescence, violet. Silver in distilling gives off a blue-white vapor, while that volatilized by the electric arc passing between silver electrodes emits yellowish green light. The color of the film obtained in many cases agrees very well with that of the incandescent vapor. In some instances, however, there is no similarity, a fact which is probably due to failure to obtain the proper conditions for the volatilization and deposition. The perfection and continuity of the deposit is easily destroyed by very slight changes in the conditions.

The color of a film will vary somewhat with the thickness, but as far as I have observed the colors extend over a very limited portion of the spectrum. Each metal possesses a strong tendency toward a characteristic color, which is produced when the film is as thick as it can be to transmit any light.—*W. L. Dudley, in Am. Chem. Jour.*