

In the third lantern a triform oil-apparatus was placed. Each of the three oil-lights is in the focus of a lens much larger than any hitherto used in lighthouses. The united height of these three lenses is much greater than that of the four lenses of the quadriform gaslight, and the light transmitted is the greatest ever produced from oil in a lighthouse. Thus equipped the Trinity House began their experiments. They purchased the right of way for miles across the Downs, and built at various distances from the lights, wooden huts for the accommodation of the skilled observers they employed. The distances between the temporary lighthouses and these huts were carefully measured and staked out. Mr. Vernon Harcourt, F.R.S., was appointed by the Board of Trade to superintend the photometric measurements of the respective lights, and the ordinary light-keepers of the Trinity House service were placed in charge of the huts. Besides all this, telephonic communication was established between the huts, the temporary lighthouses, and the engine-rooms. Last April the lights were lighted for the first time, and a Committee of the Elder Brethren proceeded to inspect them at one of the huts.

The electric light was found to be by far the brightest light; next to it came the gas light, and then the oil. Almost every night from that time to the present these three lights have been exhibited; and all who choose to look could see the effect, which was indeed exceedingly interesting. It is no secret that, while on every occasion when the weather was clear, the order of merit was as above; yet on the occurrence of fog the electric light, which in clear weather had been so superior to the others as to have been pronounced almost too dazzling for practical use, faded away and became less visible than either of the other two lights. This failure of the electric light to make itself seen in a fog is, of course, fatal to it as a lighthouse light; and, if these experiments have had no other effect than to prove the assertion that had been repeatedly made by one or two scientists as to this defect in the electric light, they will not have been made in vain. The comparison between gas and oil, however, still remains to be determined, and the Trinity House have made a great number of photometric experiments on this branch of the subject. They have erected the longest photometric shed in the world, and have tested the burners patented by their engineer, Sir James N. Douglas, against those of Siemens, Wigham, and Sugg. The whole subject is of enormous importance to the maritime community, and no doubt the Trinity House will issue a carefully prepared report; But it will, we think, be advisable that the Trinity House should once and for all clear up the point as to the cause of the accession of the Irish Light Commissioners. It will be incumbent upon them to show that the system of lighting which the Commissioners required should be tried in the experiments has been so tried, and has had fair play, and that the burners of their own engineer have also been placed upon terms of absolute equality with those of rival manufacturers. In the face of the question asked a few weeks ago in the House of Commons—as to Sir James Douglass having sold for a large sum of money his patent right in certain burners to a company in which he holds a great number of shares, while still retaining his position in the Trinity House as engineer-in-chief—it is all the more necessary for the Elder Brethren to make it plain that every system of lighting has been fairly and fully tried to its utmost limit.

The "further correspondence" on this matter, which has just been issued as a Parliamentary paper, is scarcely reassuring. Being put on their mettle by Professor Tyndall's letter, the Elder Brethren of the Trinity House came out hot and strong as the champion of their engineer, and they can hardly be said to assume that independent tone which would be desirable. No pains are spared to depreciate Mr. Wigham's inventions, and as to the Galley Head light, to which Dr. Tyndall refers as unapproached as regards "power and distinctiveness," they remark that "it is impossible to say whether those whom it so greatly impresses have considered what would follow if such lights were multiplied, and whether, among many such, the identification of one from another would become difficult." That is to say, that if powerful lights are multiplied, it will be a disadvantage to the sailor. To the ordinary mind such a condition of things would seem to be a positive advantage to the mariner. The Elder Brethren of the Trinity House, according to their own statement, are very anxious to secure economy in the administration of public money, and their preference for oil as opposed to gas is due to their belief that, while capable of as great efficiency, it is less costly than gas, although less convenient in manipulation.

This, at any rate, is what they told the Board of Trade a year ago. Perhaps they have by this time discovered, as a result of the trials mentioned above, that oil is by no means capable of as great efficiency as gas as a lighthouse illuminant. As to the relative merits of the inventions of Mr. Wigham and Sir James Douglass, the Elder Brethren enter into a long explanation, in the course of which they again trot out this plea of economy. They argue that it has yet to be proved that electricity is not the lighthouse illuminant of the future, and that, therefore, to pay a high price to Mr. Wigham for his invention, or, indeed, to adopt that of Sir James Douglass, would be a mistake. This was the opinion of the Elder Brethren twelve months ago, and reads very prettily. But the recent trials must have convinced even the Trinity House that the electric light may be said to be almost out of the race at present. Altogether we cannot regard the defence which the Elder Brethren put forward as particularly ingenuous. The report from the Scotch Lighthouse Board has a much better ring about it. They take no one-sided view of the case, and they insist upon the necessity of honest and straightforward experiments, which will once and for all settle the difficulty. On the whole, it would appear that there is now some prospect of this squabble being brought to a termination, and, irrespective of the claims of this or that inventor, it is eminently desirable in the interests of the sailor that the best possible light should without further delay be provided for his guidance.—*Ex.*

COLOR BLINDNESS.

During the past few years the attention of scientists has been largely drawn to the investigation of this peculiar trait. As a result color blindness is no longer regarded as a phenomenal curiosity. It is recognized as a congenital and hereditary defect in the structure or condition of the optic nerve. The delicate cones and rods as they are technically termed which form the final terminal elements of the optic nerve fibres of the retina, while working in unison as a whole, each has its own separate work to perform. The cones gives us perception in color, the rods gives us perception of shape. There may be a defect in one without impairing the sense of the other. Thus a man may be color blind and still be able to distinguish form. There are three primaries, red, green and violet, and there are three distinct retinal color zones. It is only in the center of the retina that we have perfect perception. There we have all three of the primaries, in the zone outside of that, we see only green and violet; in the third zone still further beyond we see only violet and blue. It is necessary in order to get a perfect view of anything to bring it directly under the center of the retina. Color blindness is generally confined to the two primaries, green and red. To this fact might be traced many of the disasters which have occurred where signal lights are used. It will undoubtedly become necessary when this defect is more universally understood to require a certificate of perfect chromatic perception from all employees desiring positions where signal lights are used. Color blindness is much more prevalent among males than it is among females. B. Joy Jeffreys, M.D., of Boston, while testing nearly 200,000, found 805 color blinds among 19,198 males, and only 12 defective in the chromatic sense among 14,940 females. This is a much smaller per cent. than other examiners have found. The difference has nothing whatever to do with the sexual opportunities for handling colors, but is solely due to the absence of that perceptive faculty in the retinal structure. It is impossible to try and educate the sense, as there is nothing to begin work upon.—*Ex.*

THE LIMITS OF HEARING.—Attention has been directed of late to the experiments made by M. Panchon on the limits of hearing, the results being communicated to the French Academy of Sciences. The notes were produced by a powerful siren of the kind invented by Cagniard-Hatour, and actuated by steam. It seems that the highest audible notes produced in this way had 72,000 vibrations per minute. M. Panchon had also vibrated metal stems fixed at one end and rubbed with cloth powdered with colophony. In diminishing the length of the stem the sharpness of the note is increased. Curiously enough, he finds that the length of stem giving the limiting sound is independent of its diameter; and for steel, copper and silver, the lengths are in these ratio to the respective velocities of sound in these metals—that is, as 1,000 for copper, 1,002 for steel, and 0,995 for silver. Colophony appears to be the best rubbing substance.