minutes after sunset; November 3, a brilliant orange sunset after a very clear day."

These observations were recalled by the receipt within a few days of a pamphlet from Mr. T. F. Claxton on "The Recent Sunset and Sky Glows." This paper was presented to the Mauritius Meteorological Society on August 27, 1901.

The first few paragraphs are as follows:—

"The gorgeous sunsets and sky glows of the past three months recall those vivid displays of 1883 and 1884 which were associated with the disastrous volcanic eruptions at Krakatoa, in the Straits of Sunda, and it is not surprising to learn that toward the end of May of this year similar, though less serious, eruptions occurred in about the same locality, according to the following cablegram which appeared in the *Daily Graphic*:—

"'Batavia, *May* 23, 1901.—The volcano of Keloet is in eruption. It is reported that there has been great loss of life among the natives. District of Kediri enveloped in total darkness.'"

The sunset glows at Blue Hill followed this eruption, and the sky glows at Mauritius after about the same interval as similar but more brilliant glows in these latitudes followed the eruption of Krakatoa. It would be extremely interesting to know if there are observations at intervening places. We should be glad to receive notes of such at the Blue Hill Observatory, Hyde Park, Mass., U.S.

I wish also to call attention to the recent violent volcanic eruption in the island of Martinique, and suggest that observers be on the watch for the earliest optical phenomena. We should be glad to receive notices of such observations. There were some marked barograph undulations at Blue Hill on the morning of May 7 which are perhaps connected with this volcanic eruption. HENRY HELM CLAYTON.

Blue Hill Observatory, Hyde Park, Mass., May 10.

A Method of Showing the Invisibility of Transparent Objects under Uniform Illumination.

As is well known, a perfectly transparent object is visible only in virtue of a variable illumination. This condition might be approximately realised, as Lord Rayleigh points out in his article on "Optics" in the "Encyclopædia Britannica," on the top of a high monument in a dense fog. It is doubtful, however, if the experiment would be very successful even under these conditions, as the observer's body screens the light in certain directions, making the illumination far from uniform. The following method I have found to give very good results:—

The inside of a hollow sphere of metal, which can be separated into two cups, is thickly coated with Balmain's luminous paint. A small hole, not much larger than the pupil of the eye, enables the observer to view the interior and any objects within the sphere. I used for the sphere one of the metal floats which are used as automatic regulators in water tanks, and which can be obtained from any plumber. The float was made in two parts, which were easily separated by melting the solder. It is rather difficult to get a good uniform layer of the paint. Several coats are required, and even then it is apt to appear streaky in the dark. I am inclined to think that a better plan would be to mix the dry powder with boiled down Canada balsam, which will harden on cooling, and coat the outside of two glass hemispherical evaporating dishes with the hot mixture. The lips of the dishes would make the eye-hole. This mixture I have found produces much more uniform surfaces, and I am employing it at the present time in some experiments in infra-red photography.

If the inner surface is exposed to sunlight, and a transparent object such as a glass or crystal ball, a thick lens or a cut glass decanter stopper is put in the interior, it will be found to be practically invisible when viewed through a small hole, for light of equal intensity is incident in every direction. I have found that a large stopper with many facets does not quite disappear, some of the edge facets appearing darker than the diffused blue glow which fills the interior of the ball. This I believe to be due to the fact that the light reaching the eye from these facets by refraction happens to have undergone several internal reflections and suffered a loss by absorption owing to a long path through the glass. The luminosity of the interior of the sphere is not quite uniform, however, and this may be sufficient to explain the appearance of these facets. The observation is best made in a darkened room, the eye being brought close up to the small aperture.

Since writing the above I have tried the balsam mixture on the outside of hemispherical glass dishes. It is, however, better to scratch a small hole in the paint than to attempt to use the lips of the dish as an aperture, as in the latter case the line of union, which is always slightly darker than the rest of the surface, cuts directly across the field of view, which is a disadvantageous arrangement. R. W. WOOD.

Johns Hopkins University, Baltimore.

Misuse of Coal.

THE tone of Prof. Perry's letter in reply to Mr. Rosenhain is so acquiescent that it may seem to diminish the force of his original contention as to the national misuse of our stock of coal. There are two considerations which ought to be stated in reply to the plea that men may learn to grow their fuel as they go on, by a proper cultivation of the best vegetation.

The first is this. The soil will not long continue to yield food if it be asked to provide fuel also. About three years ago Sir W. Crookes devoted his address, as president of the British Association, to the consideration of the present position of the world's food-supply question, and arrived at the conclusion that the outlook was not far from a gloomy one.

In that conclusion he was but echoing Malthus, though with much better data and a more complete record as to what were in Malthus' day unexplored countries.

If examination of the food-yielding powers of the soil leads to such a result, it is evident that to add an additional demand for fuel will seriously injure both. Even though Malthus and Sir W. Crookes be only partially right, enough is left to prevent us getting any long-lived satisfaction by growing fuel. There remains the possibility of "intensive" cultivation, and this may be one form of the new engine Prof. Perry asked scientific men to look for. Already Lord Rayleigh has made a bold attempt to make this economically possible by preparing nitric acid from the air. Perhaps with the resources Prof. Perry asked for, Lord Rayleigh might succeed.

The second point is this. Prof. Perry's concern was mainly for British resources. The economic life of a large proportion of our people is bound up with an economic advantage in fuel and other minerals. Every scientific discovery which raises the efficiency of transformation from coal fuel to mechanical power helps to defer the day in which England's mineral endowment will no longer be exceptional. The moment that oil or other natural fuel can compete with coal in the open markets, our prosperity must begin to decline. Similarly, if fuel can be grown to compete with coal, we lose position, simply because we cannot expect to grow so easily and well as many other countries.

The motive impelling towards a constant search for improved efficiency in the use of coal is therefore doubly strong on our people and Government. Any improvement would be helpful to the whole world; for us it would defer a calamity, possibly for a very long time. W. HIBBERT.

101 Goldhurst Terrace, N.W., May 20.

The Conservation of Weight and the Laws of Thermodynamics.

IN NATURE of May 15, Lord Rayleigh uses the laws of thermodynamics to prove the conservation of weight.

In regard to the doctrine of the conservation of energy (the first law of thermodynamics) the following statement is made in Maxwell's "Theory of Heat," p. 145, tenth edition: "The evidence which we have of the doctrine is nearly if not quite as complete as that of the conservation of matter."

Taking this passage to imply that the two doctrines, conservation of weight and of energy, are to be held true as far as experiment has proved them true, and no farther, the question arises—To what extent have the laws of conservation been proved?

The experiments of Landolt (1893) and of Heydweiller (1901) show that the conservation of weight holds, in the cases investigated by them, to one part in one hundred thousand. The accuracy of the law to one part in a million is left under suspicion.

Energy being more difficult to measure than weight, it is unlikely that the conservation of energy has been proved to one part in one hundred thousand. At the present time, would not Maxwell say, "The evidence which we have of the conservation of energy is not as complete as that of the conservation of weight"?