left. Nothing more was seen of them till after the author's return from his summer vacation, in the middle of September, when a single female of this species made its appearance. In their inability to obtain an entrance through the closed window, they had evidently built a new nest in the vicinity, and reared their broods.

These circumstances indicate that the intellectual powers of the humble-bee are not as slight as we have been accustomed to believe. Here in this case, from October to April, — a period of six months, — had these bees remained dormant in the ground, or hidden in some crevice, and, upon regaining their activity, had not only remembered the place where they were, but had sought and found, despite the many difficulties, their last year's nest. That these individuals were from the previous year's brood, there was no doubt, as throughout the province the species nowhere else occurs, peculiar as it is to elevated and mountainous regions.

LIGHTHOUSE ILLUMINANTS.

AT the meeting of the London society of arts held on March 10, Mr. E. Price Edwards read a report of the experiments on lighthouse illuminants made at South Foreland during 1884–85. The experiments show that in clear weather all the lights — electric, gas, or oil — were too good, and that for merely sending an effective beam of light to the horizon on a dark, clear night, no one was really better than the other, although it should be said that the electric light used, on account of its dazzling brilliancy, was regarded as a nuisance rather than otherwise by mariners in the near neighborhood of South Foreland. It is quite certain that for clear weather the lower powers of any one of the illuminants would be sufficiently serviceable for the requirements of the mariner.

The oil and gas lamps were rendered thus effective by superposing one upon another series of flames. It was found, that, in respect to the adaptability of the lights for occultations, — one of the distinctive characteristics used for lighthouses, — gas was especially available, as by simply turning off the supply an occultation is promptly produced in an economic and an effective manner; whereas, with the electric or oil lamp, the use of a revolving screen was found most suitable. For colored sectors, on the other hand, the electric light is most serviceable, as, on account of its small surface, the change in color may be made more abruptly.

The general results of the observations in hazy weather show incontestably that a single electric light greatly excels the most powerful oil or gas light in penetrating-power. In an actual fog the electric also holds its own. The experience of fogs at South Foreland was not large, but was sufficient to furnish available comparisons; and it was proved beyond question that the single electric light pierces a greater depth of fog than the highest power available of either gas or oil, but in heavy fogs the mariner would not derive the slightest advantage from any of the lights used. The recorded distances to which lights were carried, or where they were picked up, in heavy fogs, range mostly from seven hundred to two thousand feet; and the superiority of the electric light is determined by penetrating two hundred or three hundred feet farther than the gas or oil light. The most powerful electric light was shut out on one occasion at fourteen hundred and fifty feet, on another at fifteen hundred, another at seventeen hundred, another at fifteen hundred, and another at thirteen hundred feet. It will be plain to all that no mariner could be benefited by a light which was not visible at such distances from the lighthouse; and, for the purpose of navigation, a difference in the visibility of the lights of two or three hundred feet is of no value whatever.

One fact stands out prominently; viz., the greater ratio of absorption by the fog of the electric rays as compared with that of the gas or oil rays. Fortunately for the electric light, as shown at South Foreland, it possesses a large reserve of initial intensity, which enables it, notwithstanding its much greater proportion of loss by absorption of its more refrangible rays, to penetrate farther than the other luminants. With three lights of equal candle-power, — one electric, one gas, one oil, — exhibited in a foggy atmosphere, there is little doubt that the electric will be eclipsed at a much shorter distance than the others. But as an electric beam can be made so much more intense than it is possible to make the gas or oil beam, the electric light, though heavily handicapped by its competitors, by the very superabundance of its own luminous energy, may be made to penetrate the farther.

The experiments have also shown clearly that the lights from gas and oil are very much alike in illumining-power: indeed, under some conditions, the oil-flames seem to be rather the better. They have also shown that the oil-lights can be superposed with the same facility as the gas-lights. As yet, no oil-flame has been brought to the enormous size of the 108-jet burner; but, as this enormous size of flame is not required, the difficulty is of no great consequence. As the two lights were shown to be so nearly equal, the questions of convenience and economy assume

the greater importance in connection with their relative merits as lighthouse illuminants.

The final conclusion of the experimenters was, that, for the ordinary necessities of lighthouse illumination, mineral oil is the most suitable and economical illuminant, and that for salient headlands, important land-falls, and places where a very powerful light is required, electricity offers the greatest advantages.

METAL-WORK OF THE BURMESE.

BOTH Burmans and Shans are expert blacksmiths, says the Journal of the Society of arts. The latter forge all the *dahs* ('native hatchets') used by themselves and their neighbors in the Hotha valley; and they annually resort to Bhamo, and the villages in the Kakhyen hills, for the purpose of manufacturing them. Their bellows are of the most primitive stamp, consisting of two segments of bamboo, about four inches in diameter and five feet long, set vertically, forming the cylinders, which are open above and closed below, except by two small bamboo tubes, which converge and meet at the fire. Each piston consists of a bunch of feathers, or other soft substance, which expands and fits tightly in the cylinder while it is being forcibly driven down, and collapses to let the air pass as it is being drawn up. A boy perched on a high seat or stand, works the two pistons alternately, by the sticks serving as piston-rods. Charcoal is used for fuel.

The casting of large and small articles in brass, bronze, and other alloys, is much practised, always adopting the method known as *à cire perdue*. First a clay model is made, and coated with beeswax to the thickness of the intended cast, and again covered with an outer skin (two inches thick) of clay mixed with finely chopped straw; this latter coat is provided with funnel-like holes, for pouring in the molten metal, at intervals of four inches, and with straw-holes for letting out imprisoned air. Holes are also provided at the bottom for the escape of the melted wax.

THE GREAT SILVER-MINES OF THE WEST.

VALUABLE indeed have been the scientific results which geology has incidentally received through the great mining undertakings of the west. The studies of von Richthofen, of King, and of Zirkel, on the rocks of the Washoe, have been equally welcome to geologists at home and abroad as contributions to the general principles of their science.

The importance of a thorough and detailed geological investigation of regions possessed of great mineral wealth is at once apparent. The geologist may afford the prospector and the capitalist just that information which is most needed; while, in turn, the shafts and tunnels of the latter supply him with sections and exposures of the rocks, which he could never otherwise hope for. How keenly the advantages of such a combination are appreciated by the government geological survey is abundantly proven by the recent elaborate monographs by Becker on the geology of the Comstock Lode, and by Irving on the copper-bearing rocks of Lake Superior; while others of a similar nature are now in course of preparation on the silver districts of Eureka and Leadville by Messrs. Hague and Emmons. Nor may we pass without mention, in this connection, the extremely important contribution recently made by Messrs. Hague and Iddings to what we know of the influence of heat and pressure in conditioning the structure of an eruptive rock. No such conclusive evidence that the holocrystalline structure of an igneous mass depends upon the slowness with which it solidifies, had ever before been discovered as that which they found in the microscopic study of the rocks displayed in the hundred and eighty miles of shafts and galleries at the Comstock.[1]

But the value of such technical papers can at most be appreciated only by a few. Specialists in the same field of scientific inquiry, or the prospector or miner who consults them in hope of some practical suggestion, will be their only readers, even though the results which they contain are broad and far-reaching in their significance.

Nevertheless there is connected with the development of a vast mining industry very much to awaken a popular interest. The accidental discovery of rich mineral treasures in the heart of a mountain wilderness; the rushing thither in hordes of men of every type, all eager to secure the largest prize; the human ingenuity and energy displayed in overcoming the vast obstacles which nature has placed in the way of transportation; the story of successes and disappointments, of fortunes made and lost, — all this gives scope for the display of the strongest human passions, and contains the elements of a tale whose truth is more romantic and more exciting than fiction.

In a volume[2] quite different in its character

[1] *Bulletin No.* 17 *of the U. S. geological survey.* On the development of crystallization in the igneous rocks of Washoe, Nevada.

[2] *Monographs of the U. S. geological survey.* Vol. iv. Comstock mining and miners, by ELIOT LORD; vol. vii. Silver-lead deposits of Eureka, by J. S. CURTIS. Washington, 1883, 1884. 4°.