group of Cinchonaceæ," which is distinguished by numerous seeds in each carpid, though both are included in the same family of Rubiaceæ.

10. (P. 407).—The conical mound of the Flamingo is not at all an error in natural history. I have seen several of these nests with the eggs on the top of the heap on the Roques Islands, north of La Guaira.

11. (P. 412).—*Vulpes cancrivorus.* There is no species of true *Vulpes* in South America, if we follow the distinction established by Burmeister ("Syst. Uebersicht der Thiere Brasil.," i. 92), and the animal in question is undoubtedly the *Canis cancrivorus*, Desm.

12. (P. 431).—"Kurumanni Wax. This is composed of the wax of a wild bee (*Ceroxylon andicola*), mixed with a pitch-like substance obtained from several trees, chiefly the Maam-tree." It is scarcely possible to believe that the accomplished editor of the "Wanderings" should have penned these lines, where a noble palm of the Andes is changed into a wild bee. The latter is most likely a species of *Melipoma*. The *Kurumanni wax* may be identical with a pitch-like substance, called *Caraman*, *Paraman*, or *Peraman* in Venezuelan Guayana, and which is obtained from *Moronobœa coccinea*, Aubl.

13. (P. 434).—The mahogany tree belongs to the family of Meliaceæ, but not to the group of Cedraceæ (or better Cedreleæ).

14. (*Ibid.*).—*Maribunta* is not a Portuguese word signifying a wasp. In Brazil the word *maribondo* is used for a certain species of wasp, but the name is taken from the Tupi language.

15. (P. 440).—*Mosquito.* Even in popular works on natural history authors should call everything by its real name, and it is therefore altogether wrong to speak of the *bites* of mosquitoes; *sting* would have been just as short, and evidently more correct.

16. (P. 447).—*Pataca.* Perhaps we may read *paraca*, one of the names of *Ortalida motmot*, Wagl.

17. (P. 473).—*Sting Ray. Trygon pastinaca* is a maritime species; but there are several other ones in South American rivers, as *Tr. hystrix*, &c.

18. (P. 473).—*Sugar-cane* is *Saccharum* (not *Saccharinum*) *officinarum.*

19. (P. 474).—"The tiger-birds derive their popular name from the peculiar cry which they utter." What powerful lungs they must have, these tiger-birds, in order to be able to roar like a jaguar! This singular blunder might have been avoided by reading carefully what Waterton says (p. 195), that it has no song, its name being due to the black spots on a yellow ground on breast and belly.

20. (P. 475).—The tortoise of Guayana, as far as I know, is *Testudo tabulata*, called *Morrocoi* in Venezuela. *Cistudo carolina* is a North American species.

21. (P. 236).—*Chigoe.* What Waterton says of the hatching of this animal *within* the body of man is certainly not true. The eggs are developed outside, the larvæ leading a free existence.

Some of the foregoing remarks refer to mere clerical errors (a good many less important ones having been passed over in silence); but there are unfortunately not a few inaccurate, and even wholly erroneous statements which we were sorry to find in this *Explanatory Index.*

A. ERNST

Caracas, May 15

Swift's Comet.—Williams College Observatory

I HAVE computed a set of elements of the comet lately discovered by Mr. (now Dr.) Swift. They are from observations made by Prof. Lewis Boss, Director of the Dudley Observatory at Albany, on June 24, June 30, July 8. They are these:—

T April 27·1801, M.T. Washington.

log. *q*	9·950918	
ω [1]	3° 28′ 13″·0	M.Eq., &c., 1879·0.
Ω	45° 41′ 10″·5	
i	107° 1′ 53″·6	

For the middle observation $c - o$ $\Delta\lambda + 0''{\cdot}6$, $\Delta\beta + 0''{\cdot}3$

Or in space, both co-ordinates, about $0''{\cdot}5$.

They were computed by Olbers' method, afterwards varying *M* by the regular rule. A trifling change of *M*, which I have not now time to make, would bring a closer representation of the middle observation; say to about $+0''{\cdot}2$ and $-0''{\cdot}1$ in longitude and latitude respectively.

I am happy to say that the observatory of this college is to be repaired and put into active operation. It is about forty years old—the oldest I believe in the United States—and was built by the late Prof. Albert Hopkins. It now contains a 7½ inch equatorial, an early work of Clark; a 3¾-inch Simms transit, of the style of forty years ago, with a very poor object-glass; and a sidereal clock by Molyneux and Cope, still in good order. I have been authorised by the Hon. David Dudley Field to procure a meridian circle with telescope of about 5 inches aperture.

The gentleman just named is the founder of my professorship, the "Field Memorial Professorship of Astronomy," and it is probable that in future a portion of the duties of that professorship will consist in making observations, and in their complete discussion.

TRUMAN HENRY SAFFORD

Williams College, Williamstown, Mass., U.S.A., July 11

[1] Dist. of perihelion from node.

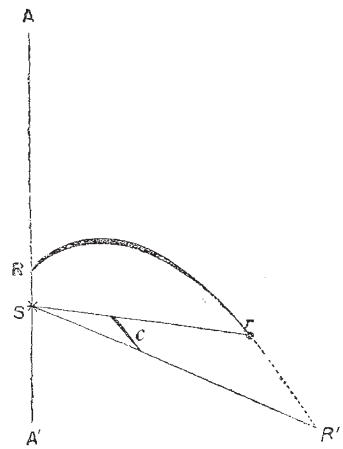
Electric Lighting

IN the evidence given before the Committee on Electric Lighting, some mention was made of the difficulty of equalising the light over any considerable area; but it is worth while to remark that by a simple form of reflector it is possible to make the light very approximately uniform over an area whose radius is twice the height of the lamp above the ground. For imagine a sphere with the lamp as a centre and its height above the ground for radius. Supposing the lamp radiates equally in all directions, the surface of this sphere will be uniformly illuminated, and its surface has an area $4\pi h^2$. If now we take a plane circular area about the foot of the lamp-post with radius R such that—

$$\pi R^2 = 4\pi h^2 \text{ or } R = 2h,$$

it is plain that by a proper distribution by reflection of the light which would pass through the imaginary sphere outside the solid angle subtended at the lamp by the plane circular area, the illumination over that area may be made uniform and equal in intensity to that near the foot of the lamp-post.

To find the proper form for the reflector, which is of course a surface of revolution, it is necessary to find the angle which



each zone of the reflector subtends at the lamp in terms of the angle in which the light is reflected by it. This is given by the equation—

$$\sin\phi\, d\phi = \left(\frac{1}{\cos^3\theta} - 1\right) d\theta,$$

with the condition $\phi = 0$, when $\theta = \tan^{-1}2$, where taking the lamp-post as the polar axis, the upper end being north, $(90 - \phi)$ is N. latitude of that zone of the reflector which sends out its light in S. latitude $(90 - \theta)$. The polar differential equation of the curve for the reflector may then be easily found; it is—

$$\rho\frac{d\phi}{d\rho} = \cot\frac{\theta + \phi}{2}.$$

A figure of the curve is given below at R R′. The surface of the reflector is swept out by the revolution of R R′ round A A′. The dotted portion r R′ should be replaced by a separate zone shown at *c*, but the chief value of this will be as a screen to prevent the light from being visible at low altitudes, the small quantity of light reflected by it merely going to reinforce the illumination in the immediate neighbourhood of the lamp. Such reflectors might be applied with great advantage to powerful lights placed at considerable elevations.

A. MALLOCK

Brampford Speke, near Exeter, July 14