certain resistance represents the *Ohm*. The *Ohm* is a small coil of German silver wire representing the resistance overcome by a current in a certain time." What kind of conception can Mr. Beechy have of current and of resistance?

Still, as we have already said, we are much pleased with Mr. Beechy's little book. The author can readily make the necessary improvements in a future edition.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

Action of Light on Ebonite

IT is well known to electricians that the insulating power of ebonite gradually diminishes in consequence of the formation of a conducting layer of sulphuric acid on the surface (produced by the oxidation of the sulphur used in vulcanising). It is perhaps not so well known that exposure to light facilitates this change, if indeed it is not an essential condition.

In order to put this to the test, a plate of ebonite polished on both sides was cut into four pieces, each about 52 mm. long, 22 mm. wide, and 8·5 mm. thick, exposing therefore a surface of about 3,500 square millimetres (the edges were not polished), and one half of each piece was varnished with an alcoholic solution of shellac. Two pieces were placed in wide test tubes plugged with cotton wool, and the other two were sealed hermetically in similar tubes. One of the sealed tubes and one plugged with cotton wool were placed in a dark drawer, and the other pair exposed to light in the laboratory, and during the latter part of the experiment to direct sunlight. The experiment was commenced on December 26, 1874, and after some time minute drops of liquid were perceived on the ebonite exposed to light and air, the remaining three pieces retaining their original appearance. Between September 1 and 21 of this year the sealed tube exposed to light was accidentally broken, so that for a period of less than three weeks the ebonite in it was exposed to both light and air. On September 21 the tubes were opened, the ebonite washed with water, and the amount of acid determined by standard solution of caustic soda. No trace of acid could be detected on either of the pieces of ebonite which had been kept in the dark; on the one which had been exposed to light in the closed tube, ·343 milligrammes of sulphuric acid were found, and on that exposed to light and air, 2·646 milligrammes.

By a mistake it was not ascertained whether the part of the ebonite which had been varnished had become acid, but during the time of exposure small drops were also perceptible on this portion of the surface. When the pieces were exposed to direct sunlight another change became visible, the drops being replaced by what appeared to be small particles of a yellowish white solid. This may have been due to the heating of the black material by the sun and consequent action of the strong acid on the solid.

I was led to try this experiment by noticing that an ebonite plate electric machine which had been kept in a light room had changed in colour except on those portions which had been protected from light by the rubbers. The exposed surface acquired a brown colour and the machine acted very badly. On cleaning the plate with a hot solution of caustic soda, large quantities of ammonia were evolved and the brown surface became softened, so that it could be easily scraped off.

I had an opportunity of noticing a remarkable instance of this action a short time since in the laboratory of my friend, Mr. Warren De la Rue. An apparatus with an ebonite base, with three adjusting screws, was standing at some distance from a window. The surface of the plate was covered with a fine dew of an acid liquid, except at the parts where the shadows of the heads of the screws fell. The surface at these places completely retained its original polish.

The interest of this matter must be my excuse for communicating the results of an incomplete experiment.

Royal Indian Engineering College, HERBERT MCLEOD
Cooper's Hill, October 2

Visual Phenomena

THE following quotation was written, and a stereo-slide to which it was appended was sketched by myself in January last, and shown at the *soirée* of the Manchester Mechanical and Scientific Society then held:—

"In looking through comparative darkness at any bright light, the writer, who is near-sighted, sees in place of such light or any number of such lights, a bright disc or discs each like the stereoscopic combination of the figures here shown.

"Are such figures seen by other myopic subjects, and do they consist of the middle portions of the crystalline lenses as seen *from within?*

"In order to develop the figures the source of light must be sufficiently distant to subtend an angle of about one-twelfth of a degree; the discs have an apparent diameter of about 1° or more, being like the pupils which seem to define their outline, persistently variable in size (*i.e.*, always *on the move*). The disc-patterns are constant in markings and position, and their brighter lines irradiate the darkness (of the vitreous humour) as though by refraction from the (?) denser portions of the lens."

The discs above mentioned differ a little in each eye, but the groundwork in both cases is a somewhat irregularly five-armed star; each arm has a shaded axis with bright margins, and they radiate from a luminous ring inclosing a darker central spot. The whole figure is well illuminated, its details being defined rather by variations of light than by dark markings, and their comparative brightness *inter se* being not unlike that shown by the various parts of the lunar surface at the full. The intervals or *sectors* of the figures are filled with a mottled pattern not easy to sketch; one space contains a figure like a Y with the stem outwards; another a V point inwards. Some dark spots, inside bright rings, as they are exposed or excluded by the margin of the figure, curiously define the varying size of the pupil as one approaches or recedes from the light; at about 12 yards from (say) a street lamp the disc is suddenly supplanted by the true form of the gas flame.

I see these appearances with the unassisted eyes; a concave lens at once snuffs them out. About sixteen years ago I tried some experiments with *convex* lenses, and found that on holding the lens farther from the eye than its (the lens's) focal distance, the star figure suddenly became a NEGATIVE—its cardinal points reversed, its lights shadows, and *vice versâ;* the arms bright, with shaded borders, and the dark spots bright, with shaded rings.

On coming from darkness into a gas-lighted street, the star discs appear large for about a second, then suddenly contract, but retain a slight oscillation, corresponding with the slight but incessant movements of the iris. The conjunction of lightning and street-lamps has a curious effect; *after* each flash the hundred or more of discs, one at each light, suddenly contract and more leisurely expand, the contraction taking about one second and the readjustment about four.

In place of Mr. Mallock's Fig. 2 (p. 350), I get a sort of very acute St. Andrew's cross, its arms consisting of *parallel* rays crossed by numberless very fine striations.

Fig. 3 I only see as a tangled confusion, owing to the hairs not being so neatly arranged as in Fig. 4; yet their foreshortened crookedness seems, by way of amends, to be responsible for the following:—

In looking towards, but a little below, the sun, which should be at about its winter meridian altitude, the upper field of view is crossed by a sort of variegated aurora of rainbow colours, which have almost a polariscope brightness, and are lined and ringed, as it were, upon a sort of chain pattern foundation.

It was in November or December last that I first found that the before-named star figures were not necessarily extinguished by a light sufficiently strong to allow of my sketching them; the occasion being a highly successful Manchester copy of a London fog. A lucid interval and a lowered gas-jet in a large room accidentally gave the requisite conditions.

If considered of sufficient interest, I would send copies of the discs which are sketched nearly two inches in diameter. The disc of a gas-lamp at 100 yards distance has an apparent diameter of nearly 3 feet, and a lighted up cotton-mill is all light, no wall. H. B. BIDEN

Sale, Manchester

IF Mr. T. W. Backhouse (NATURE, vol. xiv., p. 474) is right in interpreting the phenomenon of radiance described by Mr. A.