anyone who has attempted to gain a natural conception of such forms from only alcoholic material. In the attic is a large pigeon house for breeding purposes. Glass beehives and ant nests are used for the study of community life. In fact, it is planned to have every order of animals represented by typical species in the aquaria and vivaria, so that the study of function may go hand in hand with the study of form.

In the museum each order is represented by specimens in alcohol, skins, skeletons, a dissection accompanied by a water-color sketch, with all the parts plainly labeled and embryological models with explanatory charts, in order that the visitor or student may learn as much as possible of the forms exhibited rather than become overwhelmed with the wealth of species.

AN ARTIFICIAL REPRESENTATION OF A TOTAL SOLAR ECLIPSE.

IN preparing for polarization experiments on the solar corona it is extremely desirable to have an artificial corona as nearly as possible resembling the reality, for preliminary work. The only device of the kind that has been used to my knowledge is the arrangement described by Wright in his eclipse report, consisting of a cardboard funnel, lined with black cloth, with a light at the back. This gives a ring-shaped illuminated area radially polarized. It is believed that the contrivance about to be described will be found far better adapted to work of this sort, for the artificial corona in this case resembles the real so closely as to startle one who has actually witnessed a total solar eclipse; the polarization is radial, and is produced in the same way as in the sun's surroundings, and the misty gradations of brilliancy are present as well. So perfect was the representation that I added several features of purely æsthetic nature, to heighten the effect, and finally succeeded in getting a reproduction of a solar eclipse which could hardly be distinguished from the reality, except that the polar streamers are straight as drawn by Trouvelot, instead of being curved, as all the recent photographs show them. The curious greenish-blue color of the sky and the peculiar pearly luster and misty appearance are faithfully reproduced. For lecture purposes an artificial eclipse of this sort would be admirably adapted, and I know of no way in which an audience could be given so vivid an idea of the beauty of the phenomenon. Drawings and photographs are wholly inadequate in giving any notion of the actual appearance of the sun's surroundings, and I feel sure that any one will feel amply repaid for the small amount of trouble necessary in fitting up the arrangement which I shall describe.

A rectangular glass tank about a foot square on the front and five or six inches wide, and a six-candle-power incandescent lamp are all that are necessary The dimensions of the tank are not of much importance, a small aquarium being admirably adapted for the purpose. The tank should be nearly filled with clean water, and a spoonful or two (the right amount determined by experiment) of a weak alcoholic solution of mastic should be added. The mastic is at once thrown down as an exceedingly fine precipitate, giving the water a milky appearance. The wires leading to the lamp should be passed through a short glass tube, and the lamp fastened to the end of the tube with sealing wax, taking care to make a tight joint, to prevent the water from entering the tube. (Fig. 1.) Five or six strips of tin foil are now fastened with shellac along the sides of the lamp,

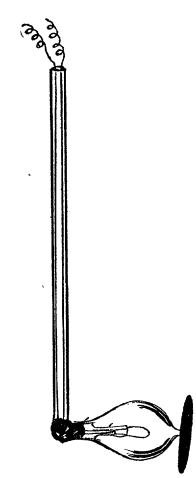

FIG. 1.

leaving a space of from $\frac{1}{2}$ to 1 mm. between them. The strips should be of about the same width as the clear spaces. They are to be mounted in two groups on opposite sides of the lamp, and the rays passing between them produce the polar streamers. The proper number, width and distribution of the strips necessary to produce the most realistic effect can be easily determined by experiment.* A circular disk of metal, a trifle larger than the lamp, should be fastened to the tip of the lamp with sealing-wax, or any soft, water-resisting cement; this cuts off the direct light of the lamp and represents the dark disk of the moon. The whole is to be immersed in the tank, with the lamp in a horizontal position, and the metal disk close against the front glass plate. (Fig. 2.) It is a good plan to have a rheostat in circuit with the lamp to regulate the intensity of the illumination. On turning on the current and seating ourselves in front of the tank we shall see a most beautiful corona, caused by the scattering of the light of the lamp by the small particles of mastic suspended in the water. If we look at it through a Nicol prism we shall find that it is radially polarized, a dark area appearing on each side of the lamp, which turns as we turn the Nicol. The illumination is not uniform around the lamp, owing to unsymmetrical distribution of the candle power, and this heightens the effect. If the polar streamers are found to be too sharply defined or too wide, the defect can be easily remedied by altering the tin-foil strips. The eclipse is not yet perfect, however, the illumination of the sky background being too white and too brilliant in comparison. By adding a solution of some bluish-green aniline dye (I used malachite green) the sky can be given its weird color, and the corona brought out much more distinctly. If the proper amount

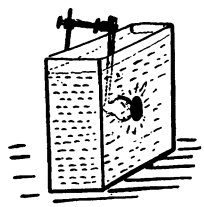

FIG. 2.

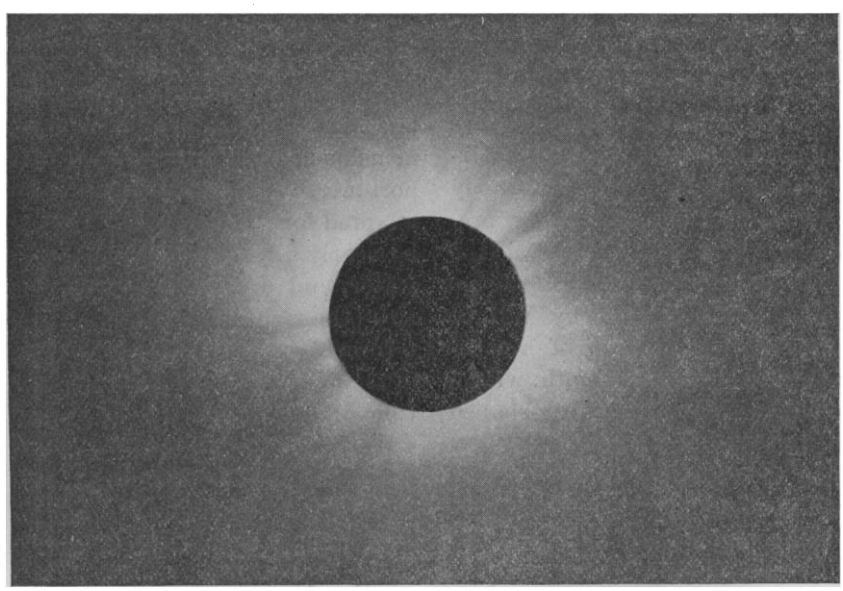

FIG. 3.

* Probably black paint could be used instead of the tin-foil strips.

of the dye be added, the sky can be strongly colored without apparently changing the color of the corona in the slightest degree, a rather surprising circumstance, since both are produced by the same means. We should have now a most beautiful and perfect reproduction of the wonderful atmosphere around the sun, a corona of pure golden white light, with pearly luster and exquisite texture, the misty streamers stretching out until lost on the bluish-green background of the sky. The rifts or darker areas due to the unequal illumination are present as well as the polar streamers. The effect is heightened if the eyes are partially closed.

A photograph of one of these artificial eclipses is reproduced in Fig. 3. Much of the fine detail present in the negative is lost in the print, and still more will doubtless go in the process of reproduction. The coronal streamers extend out much farther than is indicated by the photograph. No especial pains were taken to get the polar rays just right.

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SCIENTIFIC BOOKS.

Street Pavements and Paving Materials. A Manual of City Pavements: the Methods and Materials of their Construction. For the use of Students, Engineers and City Officials. By GEORGE W. TILLSON, C.E., President Brooklyn Engineers' Club, etc. New York, John Wiley & Sons. 1900.

As might be inferred from the title, this is a very pretentious book. The design of the author appears to have been to exhaust the subject. A very careful examination of the book has convinced the reviewer that for the purpose of the reviewer the accomplishment of this design may be divided into two parts: (1) That portion of the book that comes strictly within the perview of the engineer, and (2) that portion which does not.

Before proceeding to the consideration of these parts we wish to remark certain conditions that relate to the work as a whole. The author does not appear to have been impressed with the gravity and seriousness of the great work he has undertaken, but a certain atmosphere of flippancy pervades some of the most important discussions; as witness his definition of the word Bitumen on page 43.

Again, either the manuscript was very carelessly prepared, or the proofs were very carelessly read, for the grave errors that are too numerous to mention can hardly be laid to the account of the printer. For illustration turn to page 53. The sentence, "He contends that by the use of petroleum ether a large amount of asphaltene is dissolved and is consequently called asphaltene," is nonsense, as it stands; the last word should be 'petrolene.' Further on he says, "I had to admit, and do admit, that the analysis as carried out by the later methods suffices to make identity or nonentity of two samples probable or highy probable." Nonentity should be nonidentity, and highy should be highly. To point out all the errors of this description would require too much space.

That portion of the work that relates strictly to engineering problems appears to be carefully prepared, and the various problems discussed appear to be treated with intelligence and discrimination. Had Mr. Tillson, as an engineer, discussed seriously and carefully read the proofs of a work devoted to the engineering problems involved in street paving, we do not doubt that a very valuable book would have been the result. For Mr. Tillson has reaped a field of immense extent, and he has brought together an immense amount of detail from widely separated sources and has brought them into convenient form. For this his fellow members of the engineering profession, and a wider clientage of miscellaneous readers outside his profession would have doubtless given him appreciative thanks. But, as before stated, Mr. Tillson has attempted, in a very pretentious way, to exhaust his subject, and has wandered far beyond the borders of his profession of engineering, thereby committing the blunder of attempting to treat subjects learnedly of which he has no knowledge. For engineers as a class are not trained in general science. They are