SCATTERING OF LIGHT BY SMALL PARTICLES.

EDWIN MORRISON, Michigan State College.

According to the theory of scattering of light by small particles "if a beam of light is passed through a transparent medium containing in suspension small particles, the refractive index of which differs from that of the surrounding medium, light will be given off by the particles in all directions. If the particles are very small, the color of the scattered light is blue, and it is more or less completely plane polarized, the direction of vibration being perpendicular to the direction of the incident beam. If the incident beam is plane polarized to start with no light is scattered by the cloud of particles in directions parallel to that of the incident vibration." For a continuation of this discussion see Wood's Physical Optics, page 624, from which the above is quoted.

I wish to submit the following as an interesting and simple verification of the theory of scattering of polarized light by small particles which to my knowledge has not been published.

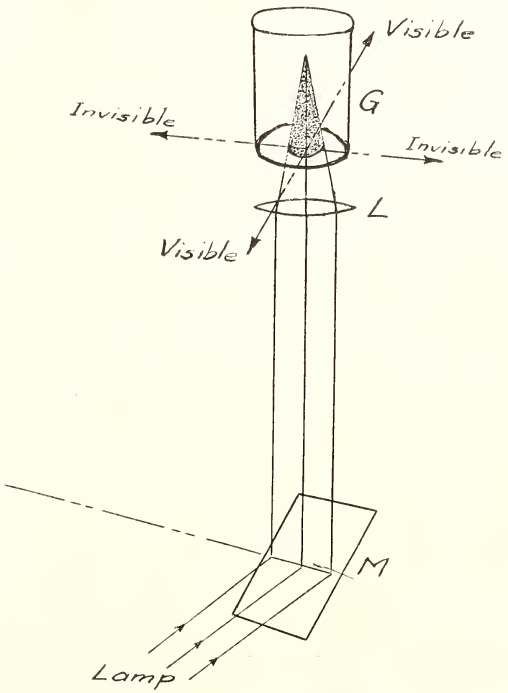

Fig. 1—Diagram of apparatus used to demonstrate the theory of scattering of polarized light by small particles.

"Proc. Ind. Acad. Sci., vol. 37, 1927 (1928)."

15—43033

Set the reflecting glass of a Norrenberg polariscope so that it makes an angle of 33° (the polarizing angle) with the vertical axis. Then locate an arc lamp at such a position that direct rays from it will be reflected vertically upward from the glass reflector along the axis of the polariscope. Place a large flat-bottomed beaker (or any flat-bottomed glass vessel) above the polariscope. Fill the beaker with a solution of uranium nitrate. Place beneath the beaker one of the short focus lenses of the polariscope. A luminous cone of light will be formed in the uranium nitrate solution which will be visible from a side position at right angles to the plane of vibration of the polarized light, and almost invisible from a side position in the plane of the vibrations of the polarized light. See figure 1. The same effect is manifest when a solution of iron chloride in water is used instead of the uranium nitrate. Any solution containing very small particles in suspension will act in like manner, though perhaps not with the same brilliance as that of uranium nitrate.

The experiment can be varied by substituting for the lens a diaphragm with a round opening. In this case a cylindrical beam of light will appear in the solution which will be visible from one direction and invisible from a position at right angles to it.

The experiment can be further varied by using a Nicol prism instead of the reflecting glass of the polariscope as a source of polarized light.

The following precautions may be noted. The experiment must be carried on in a dark room and stray light from the lamp must be avoided. In case a diaphragm is used it will produce a certain small amount of diffused light which prevents entire extinction of light in the invisible directions. The plane where the cone of light from the lens enters the beaker may also act to produce a small amount of diffused light which prevents entire extinction of light in the plane of vibration of the polarized beam. These effects can usually be screened off.