Optical Department

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A Talk on Light.

By W. E. Hamill, M.D., Instructor Optical Institute of Canada.

(Continued from last issue.)

REFLECTION.

All bodies reflect light, and it is only by means of this reflected light that opaque bodies are rendered visible. Such bodies as the pages of this book reflect light in all directions, giving us the impression of an illuminated surface; this is called "*irregular*" reflection. But smooth surfaces, such as polished metal or glass, reflect rays of light which fall upon them in a regular manner and in a definite direction, such being called "*regular*" reflection, and is that which we are now about to consider.

Reflection of light means the turning back of a beam of light by means of any polished surface, and is governed by the following law, viz.: "*The angle of reflection is always equal to the angle of incidence; and the incident and reflected rays are always in the same plane*"; *i.e.*, on the same side of the reflecting surface as is the perpendicular of this surface.

In Fig. 6, A is a beam of light which strikes a mirror M, and is reflected in the direction B. A is what is termed the

Fig. 6.

"incident" ray; and B, the "reflected" ray; and the point O on the mirror, the point of incidence.

The dotted line extending from the incident ray A to the reflected ray B is a quarter of a circle, and contains, as you know, 90 degrees. Another dotted line XO is drawn perpendicularly to the plane of the mirror M, dividing the circle into two parts. The angle AOX is the "*angle of incidence*," and BOX the "*angle of reflection*," which, according to the above law, should be equal, and which, in fact, are equal, because the line O X cuts the circle equidistant from its ends; hence each angle AOX and BOX will contain half of 90 degrees, *i.e.*, 45°. No difference in what position the mirror is turned these angles will always be found to be equal and in the same plane.

Fig. 7 proves this: AA is a semi-circular piece of wood. Round this a piece of graduated metal or cardboard is placed, having a vertical slit A in it. A rod B is made to rotate on a vertical axis upon which rod is placed vertically a plane mirror F. The incident rays of light passing through the slit A will be reflected at an angle equal to that made by

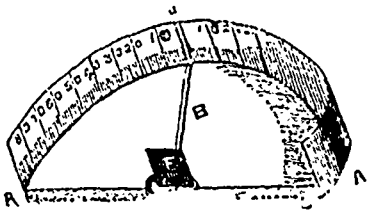

Fig. 7.

the incident rays with the mirror: *e.g.*, if the pointer be at, 10°, the reflected rays will be at 20°. If the pointer be at 0°, as in the figure, the incident ray will be reflected back upon itself of course; because the incident ray is perpendicular to the plane of the glass.

A "mirror" in optics is any polished surface which reflects rays of light in a regular manner, and are usually polished glass or metal and of three kinds: *Plane*, like our looking-glasses; *concave*, as the inside of a watch glass; *convex*, as the outside of a watch glass.

Visual Optics in Theory and Practice.

By Lionel Laurance, Instructor of Visual Optics at the Official Classes of the Worshipful Company of Spectacle Makers, and formerly Principal of the Canadian Optical Institute.

The appliances needed by the optician are not numerous, but no greater mistake can be made than that of buying inferior articles such as render the work that is to be done more difficult, longer to achieve, and not so perfect when achieved. Moreover, it should be considered that appliances are bought for a lifetime, and, therefore, any small extra outlay on them is spread over the long number of years during which they are in use and the means of making profit for the optician. Time is almost equivalent to money, and if time be saved and errors avoided the profit on optical work is increased.

Chief and foremost is, of course, the trial case, which, if complete, contains almost everything that is needed. There must be in it a full range of lenses, convex and concave sphericals from 0.25 to 20° and convex and concave cylinders from 0.25 to 6°. These must all be in pairs, and should be mounted with rings and handles, so that, when in use, they are kept clean and do not require constant wiping. The frequent cleaning of trial lenses when handled occupies quite a considerable time, and time that is spent uselessly, besides which, this frequent rubbing of their surfaces tends to scratch the lenses and causes them to soon lose their high polish. Unmounted lenses, moreover, are very liable to become chipped. The handles facilitate the taking of the lenses out from the case and inserting them into the trial frame, or *vice versa*, and renders easy the necessary rotation of cylinders.

The rims themselves should be made so that the lenses can be inserted into the trial frame with either face to the front, and not as some are made, so that they can only be inserted one way. They should also be made so that the lenses be secured by screws in order that if one be broken it can be easily replaced. This is not the case when the lenses are retained by bending the rims over their edges. Both rims and lenses should be as light as possible. It is also advisable to have the convexes and concaves mounted in rings which are of different color, say, the one lot white and the other yellow, so that a mistake cannot be made between them.

The case should contain a sufficiency of prisms, the lower numbers, say from 1 to 4°, being in pairs, and in addition to these and the sphericals and cylinders, all necessary discs, such as the opaque and black discs for occluding the eye not under test, the stenopaics for testing astigmatism, the pin-hole disc for deicding as to whether a case be correctable by lenses, the Maddox rod, the double prism, etc., for testing the motor vessels, and some colored glasses, one each red and green and others smoke and blue of different shades.

The lenses must be ground on dioptric tools, and not on those of the inch system, and numbered in diopters only, and the numbering should not be scratched on the lenses themselves, but be stamped on the handles, also the numbers should be quite distinctly marked on the divisions of the case pertaining to each lens. It goes without saying that each lens must be true as to the power marked