straight line parallel to the apex of the wedge. If between any two points on the glass we count k fringes, the difference in thickness is $k \cdot \lambda/2$. If we know that one face is flat (for example, it is an optical flat tested by some other method), we can directly interpret any departure of the fringes from straight lines as an error in flatness of the second face. The fringes therefore give us a precise measure of the flatness of a surface, provided only that a reference flat is available.

III-4. Making the Interference Test

In industrial workshops, the interference test is often made simply under white or daylight illumination. Under these conditions, fringes are visible only when the air wedge is extremely thin; they are the characteristic, vividly colored bands known as "Newton's rings." The surfaces must be perfectly clean, and brought together carefully without sideslip. Even the expert cannot always avoid scratching if the surfaces are more than about 2 inches across. A further difficulty is that as the air film becomes extremely thin, very objectionable adhesion effects arise that mechanically distort the pieces. If one considers also that in industry the pieces are rarely examined at a fixed viewing angle, and that usually neither the reference (following handling) nor the mirror (still cemented to the mounting block) is cooled sufficiently before testing, it is not surprising that the technique as ordinarily used cannot be relied on to better than a half wavelength.

A more accurate method is to use a broad source of radiation that is dominantly monochromatic (a mercury vapor lamp, for example) and to illuminate the plates perpendicularly. Even without isolating the green line of the mercury spectrum, we easily see the characteristic fringes of the wedge when we interpose paper spacers between the plates. However, it is better and far less expensive to use a simple neon glow lamp.[2] The optical arrangement shown in Fig. 50 is that devised by Fizeau. The practical details are borrowed largely from A. Couder. The glow lamp N is mounted at the focus of a simple plano-convex lens L. The flat lens surface faces the source. The focal length should be moderately long, say 15 to 20 inches for a 4-inch diameter lens. If the lamp is somewhat bulky, it may be positioned to one side, and a prism used to deflect the beam downward toward the lens, as shown (the quality of the prism is unimportant). The downwardly directed beam is slightly displaced from the perpendicular, so that the reflected rays are made easily accessible. By providing means for tilting the reference and mirror plates, the angle of incidence on the plates and the position of the reflected beam can be easily adjusted. For this purpose we either place shims under the mirror or use leveling screws as shown in Fig. 50.

Three shims for the air wedge are cut from the same sheet of paper, and may be about 0.003 or 0.005 inch thick, and $^1/_4$ to $^3/_8$ inch wide. News-

[2] These are available from electrical supply houses with a convenient standard screw base.