Light transmitted by a small portion of the photographic plate, the image of which is adjacent to that of the tip of the pyrometer lamp, is matched with equal filament brightness by adjusting the current through the lamp. The ammeter readings are readily translated into measurements of photographic density. If the tip of the pyrometer lamp filament be regarded as a filar in the eyepiece, the relative positions or wave-lengths of spectral lines on a plate are measured at the same time that their photographic densities are measured.

An example of the use of this microphotometer for measuring wave-lengths and densities of spectral lines is given and it appears that the visually estimated intensities of such lines is a geometric series in accordance with Fechner's law.

Illustrations of this microphotometer's application to the measurement of energy distribution in a broad spectral line and to the measurement of spectral sensitivity of a photographic plate, are given.

Measurements of photographic density when the plate is illuminated by parallel light are found to be much larger than when the illumination is diffuse. This experience calls attention to the importance of specifying the character of the illumination when measurements are made on light transmission of diffusing media.

NOTES ON THE TESTING OF MAGNETIC COMPASSES.¹³

By R. L. Sanford.

[ABSTRACT.]

THE work of the Bureau of Standards on magnetic compasses was undertaken in response to requests for information and coöperation from the War Department and the United States Shipping Board. It consisted of studies of the behavior of various types of compasses, the construction of special apparatus for testing purposes, and special investigations. The information thus obtained was utilized in the preparation of specifications for various types of compasses and also in the preparation of specifications for testing.

In the course of this investigation, certain facts concerning the general characteristics of compasses were brought out which

¹³ Scientific Paper No. 382.

were considered to be of interest to users of magnetic compasses. This paper gives a brief discussion of the principal performance characteristics of magnetic compasses together with a description of some of the apparatus which is used at the Bureau for testing.

PERMEABILITY OF RUBBER TO GASES.¹¹

By J. D. Edwards and S. F. Pickering.

[ABSTRACT.]

CERTAIN of the factors which determine the permeability of rubber to gases have been investigated and the relative rates of penetration of a number of gases determined. The major findings may be summarized as follows:

1. The permeability of rubber compounds varies with the composition as would be expected. The aging of rubber films is accompanied by a decrease in permeability. A similar decrease may be affected by over-vulcanization. The rubber which shows a very low permeability for these reasons is usually very much deteriorated and frequently brittle so that it is a disadvantage from the standpoint of gas lighters.

2. The permeability to any gas is found to be directly proportional to its partial pressure provided the total pressure is constant. The variation of permeability with total pressure depends on the thickness of the rubber, the way in which it is supported, etc.

3. The permeability to hydrogen is inversely proportional to the thickness of the rubber. No other gas was tested in this respect.

4. The specific permeability to hydrogen at 25° C. of vulcanized rubber similar to the grade known as dental dam is about 20×10^{-6} c.c. per minute. This value varies somewhat with the age and chemical characteristics of the rubber.

5. The temperature coefficient of permeability is quite high. For example, in the tests at 100° C., the permeability to carbon dioxide or helium was about 17 times the rate at 0° C.; the permeability to hydrogen was about 22 times as great at 100° as at 0° C.

¹¹ Scientific Paper No. 387.