radiation show the increase to vary from zero to a maximum and then again decrease, as the total brightness of the phosphorescence decreases. Measured in percentage of the total brightness the increase of light rises from zero to about one hundred per cent. at 45 minutes, under the conditions of the experiment.

The zinc sulphide was prepared by Verneuil. The decay curves plotted in terms of $1/\sqrt{I}$ against time do not give straight lines but are concave toward the time axis. By plotting all the observed curves on logarithmic paper parallel straight lines were obtained from one minute on; before one minute the lines curve. The law of decay after one minute seems to be

$$I = \frac{1}{(a + bt)^m},$$

where $m = 1.03$.

They may therefore be plotted in terms of $1/I^{.97}$ against time. The effect of different lengths or intensities of excitation or of a brief exposure to long waves after excitation is to produce decay curves with different values of a and b . The decay curve after brief action of red or infra-red does not correspond to the original curve with origin shifted.

THE PENTANE LAMP AS A PRIMARY LIGHT STANDARD.¹

BY E. B. ROSA AND E. C. CRITTENDEN.

THE primary photometric standard of Great Britain is the 10 candlepower Harcourt pentane lamp. This lamp has been investigated at the National Physical Laboratory and the Reichsanstalt, and the ratio of light given by it to that of the Hefner has been many times determined. The Bureau of Standards has been carrying on an investigation for some time on primary flame standards, including the study of the pentane lamp. We have found that pentane lamps as made from the same specification by different manufacturers, differ by several per cent. in candlepower, and hence any determination of the ratio of the pentane to the Hefner, or other primary standard, amounts only to a determination of the ratio of particular lamps. In this investigation we have studied not only the difference in lamps but also the difference in different kinds of fuels, and have devised a new form of pentane lamp which has some advantages over the Harcourt form. Results of measurements on various lamps, and with different fuels, under varying atmospheric conditions will be communicated, and suggestions made as to the important characteristics of a primary standard, these suggestions being

¹ Abstract of a paper presented at the Minneapolis meeting of the Physical Society, December 27-30, 1910.

based upon a considerable experience with lamps of different types, and also with lamps of different makes of the same type.

ON THE FUNCTION OF REST IN RESTORING A PLATINUM-IRIDIUM WIRE
TO ITS ANNEALED CONDITION.¹

BY L. P. SIEG.

THE peculiar elastic properties of platinum-iridium wire have been discussed by Guthe and Sieg,² and by Sieg.³ Among the experiments described in the latter paper were many devoted to a study of the relation between period and amplitude of vibration of the wire when used as the support of a torsion pendulum. It appeared that the relation between these two quantities was a variable one and depended largely upon the previous treatment of the wire. For example with a freshly annealed 40 per cent. platinum-iridium wire, the period changed by 0.19 per cent. while the amplitude of vibration passed over the range from 47° to 18° . On the other hand if the wire was vibrated through a large amplitude (360° from the center), allowed to die down, and then without annealing was set in vibration, it was found that the period changed by 3.46 per cent. while the amplitude passed over the range from 47° to 18° .

Certain results obtained at the time of the earlier experiments pointed to the conclusion that the condition of the wire in the second case described above was unstable, and that the wire tended to attain the annealed condition (described in the first case above) as a result of continued rest under the load used in the experiments; and the prediction was made that, with a sufficient rest, the wire might ultimately reach the annealed condition. This prediction has been verified in an observation recently made. The wire, which had been twisted through a large amplitude, and not subsequently annealed, had been hanging practically at rest for eight months. The period in the first experiment following this long rest was found to change by only 0.36 per cent. while the amplitude passed over the range from 47° to 18° , thus showing that the wire had practically reached the annealed condition. To make certain that this last result was relatively correct the wire was again annealed and vibrated at once through an amplitude of about 50° . In passing over the range from 47° to 18° the period was found to change by 0.18 per cent., thus practically agreeing with the result obtained eight months previously under similar conditions.

A second point is that the wire seems to have had its coefficient of rigidity (measured kinetically for small amplitude) increased by 2 per cent. as a result of the long rest. The increase was from 10.5×10^{11}

¹Abstract of a paper presented at the Minneapolis meeting of the Physical Society, December 27-30, 1910.

²K. E. Guthe and L. P. Sieg, *PHYS. REV.*, 30, p. 610, 1910.

³L. P. Sieg, *PHYS. REV.*, 31, p. 421, 1910.