German glass there was very little if any change. A number of samples were measured, the lowest value of 2×10^7 ohms being for a soft glass. Parks[1] has found the thickness of the water film on glass to be about 10^{-5} cm. Hence for soft glass, the conductivity of the water in the surface film is 5×10^{-3} reciprocal ohms per centimeter cube. This can be accounted for by the solubility of glass in water.

In the case of the waxy materials, water does not spread over the surface, but collects in drops. Hence we would not expect any change of surface resistivity with humidity. That such is the case has already been noted.

The presence of inorganic salts on the surface of insulators may not only lower the conductivity of the film, but it may also increase its thickness. This was shown by the measurements of Ihmori already quoted. Hence in the case of rubber which has deteriorated by exposure to the light, thereby forming considerable quantities of deliquescent salts on the surface, the resistivity changes through a very wide range due to changes of humidity.

An oil film has a much higher resistance than a water film, but in the case of the very best insulators such a film may lower the surface resistivity at low humidities. With moderate insulators, however, it may have a beneficial effect.

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A Significant Instance of Galvanometer Instability.[2]

By W. P. White.

A CERTAIN moving coil galvanometer, whose coil was very well balanced, showed for some time great steadiness while standing on a stone shelf. Subsequently, it showed in the same situation great sensitiveness to certain tremors of the building. There was no visible jiggling of the coil, but the slamming of doors, moving of heavy boxes, or pounding, in certain locations, caused a deflection often exceeding a millimeter at a meter's distance. The deflection was such as might have been produced by slight tipping of the galvanometer. It was a radial field instrument and, like most of its kind, very sensitive to changes of level. An investigation seemed to indicate that the shelf was too flexible, and the galvanometer was fastened to a stout iron bracket which was secured to two boards which had been built into the wall for such purposes. The trouble entirely disappeared, and for some time the galvanometer was almost perfectly steady again. Subsequently, the trouble reappeared as badly as before. An examination indicated that the wooden boards were not quite firmly fastened to the wall. The iron shelf was then fastened directly and firmly to the brickwork of the wall itself, and the trouble again disappeared. Conclusions: (1) It is clear that if the stone shelf had not been steady at first, or if the wooden boards had been loose from the wall at the

[1] Phil. Mag. (6), 5, p. 517; 1903.

[2] Abstract of a paper presented at the Washington meeting of the Physical Society, April 24–25, 1914.

outset, the real nature of the trouble would probably never have been discovered. The reasonable inference would have been drawn that the tremors of the building as such were too much for the galvanometer, and some unnecessarily elaborate protection would have been installed. (2) It is clear that moving coil galvanometers, at any rate those with a radial field, may suffer serious perturbations which are not the direct result of oscillations or jiggling of the coil. If in this case the perturbations had been accompanied by a small amount of jiggling, the latter would of course have been blamed. It is quite possible, therefore, that changes of level, weak fastening of shelves, and other similar preventable causes may now be responsible for much galvanometer disturbance, but are not recognized and remedied because some jiggling is also present and gets credit for the whole trouble. (3) This seems very likely to be the case where a Julius suspension of the old type, with three wires, is used, since the ordinary breezes of the room, acting on these fine wires, may produce slight irregular expansions and contractions, which cause changes of level, and therefore deflections. In such a case, the conclusion might easily be drawn that the deflections are due to the vibrations of the building, that they therefore show that the suspension is inadequate, and that no further help is possible, whereas the case may be quite otherwise. Of course, if any effect of this sort is suspected with a Julius suspension, a test can easily be made which will show whether it is present or not.

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HIGH TEMPERATURE MEASUREMENTS WITH THE STEFAN-BOLTZMANN LAW.[1]

BY C. E. MENDENHALL AND W. E. FORSYTHE.

IN view of the increasing use of extremely high temperatures (2000–3000° C.) the establishment of a reliable scale for this reason becomes increasingly important. Above 1550° C., the limit this far attained with the gas thermometer, the only method available is some form of radiation pyrometer. Of these we may use for a perfect radiator, either the one based on a measurement of the total radiation or one depending upon the spectral distribution. While in many cases the latter is more convenient to use, the former is the more sound from a theoretical standpoint, for the reason the Stefan-Boltzmann law has been chosen as defining the temperature scale.

This work may be considered in three parts: (1) A comparison of the Stefan-Boltzmann scale of temperature with the Day and Sosman scale between 1063° C. and 1549° C. (the melting points of gold and palladium). (2) A determination of the melting point of platinum in terms of the Stefan-Boltzmann scale. (3) A comparison of the optical temperature scale based on the application of Wien's Law to a pyrometer of the Holborn-Kurlbaum type with the Stefan-Boltzmann scale up to 2820° C.

Apparatus.—The optical pyrometers were calibrated by observations on a

[1] Abstract of a paper presented at the Washington meeting of the Physical Society, April 24–25, 1914.