

when with large areas, a sharp match never could be made. With this apparatus it was possible to make fairly sharp settings with such differently colored lights as acetylene, the right angle arc, daylight, the yellow flame arc and the Hefner lamp. When it comes to comparing red light with green light, however, the results are not at all satisfactory unless very low intensities are used.



Fig. 1.

The form of pattern adopted was as shown in the figure, the black representing the silver removed.

ULTRA-VIOLET FROM THE ARC.¹

By H. P. GAGE.

IN experimenting with different substances in the arc it was found that uranium gave a very nearly continuous spectrum from the visible to the ultra-violet as far as $.22\mu$. The following electrodes will give a spectrum with rather weak lines on a continuous background. Make a tube of thin sheet iron or "tin" $\frac{1}{4}$ inch inside diameter, fill with powdered uranium oxide (U_3O_8). Use as lower electrode, connect to the positive terminal and pass 6 amperes. The negative terminal may be carbon. If the current is reversed a rich line spectrum will be obtained.

The amount of ultra-violet light in a source may be photometered by using a Lummer-Brodhun photometer with a screen towards the unknown source which will transmit only the wave-lengths desired. The ultra-violet light is made apparent to the eye by using a screen coated with anthracene instead of white paper. Examples of measuring the photographic brilliancy of several arc lamps.

HEAT OF EVAPORATION OF WATER AT 100° C.¹

By ARTHUR WHITMORE SMITH.

IT is well known that the vapor rising from boiling water carries with it a certain amount of water in a finely divided state, but nevertheless still liquid. Even with a steam separator 1 per cent. or more of the total mass may be water, and unless precautions are taken the percentage of moisture in the stream from an ordinary boiler is greater than this.

These considerations lead to a feeling of very great uncertainty when one studies the methods which have been used for the determination of the heat of evaporation of water. If the steam used contained 1 per

¹Abstract of a paper presented at the Washington meeting of the Physical Society, April 21 and 22, 1911.

cent. moisture, the familiar number 537 is 1 per cent. too low. As far as I know no attempt has ever been made to determine the heat of evaporation from a quiet surface of water at 100° C. where there is small chance of spray being thrown into the vapor above.

This paper describes a new form of calorimeter in which the water is evaporated by a gentle current of air passing over its unruffled surface. Heat is supplied by an electric current, both E and I being measured in terms of a Weston cell. The temperature is maintained constant by regulating the air current to allow the evaporation to proceed just fast enough to use the heat as it is delivered by the current.

Each result is computed from two experiments, in one of which about 36 grams of water are evaporated and in the other only about 9 grams. The corresponding amounts of heat are supplied by the electric current plus small corrections. The *difference* between the two heats eliminates these corrections, and when divided by the *difference* between the corresponding amounts of water gives 541.3 ± 0.2 calories per gram for the heat of evaporation of water at 100° C.

Check experiments made and computed in the same way and with the same apparatus, but allowing the water to boil, give the old value of about 538 calories per gram.

UNIVERSITY OF MICHIGAN.

A TUBULAR ELECTRODYNAMOMETER FOR VERY HEAVY CURRENTS.¹

BY P. G. AGNEW.

TO obtain the same current distribution for both alternating and direct current, it is usual to strand the windings of the field coils of electrodynamos. For very heavy currents, this becomes a matter of extreme difficulty. An entirely different method of obtaining the same end is employed in the present instrument. The field at an outside point due to a straight cylindrical or tubular conductor is independent of any skin effect if we have axial symmetry. The field "coil" consists merely of two concentric heavy copper tubes, thus giving a circular field between the tubes. There are two moving coils astatically placed between the tubes, one on either side of the inner tube, and suspended by a phosphor bronze strip. The common axis of the tubes is placed in a horizontal position in order to allow the vertical suspension. While the distribution is not the same an alternating as on direct current, the magnetic field in the space between the tubes and hence the torque is the same. For cooling it is arranged so that water may be passed through the inner tube. The instrument was designed to carry 5,000 amperes,

¹Abstract of a paper presented at the Washington meeting of the Physical Society, April 21 and 22, 1911.