on no account mix the clips; a small gas or paraffine oil stove burning below will distribute sufficient heat to dry the paper in a short time.

If the photographer is limited to one room for his printing and finishing operations, he must himself determine the position for his toning and fixing bench, having due regard to the water supply, and light also; bearing in mind that the more convenient the place, the more work accomplished in a given time.

Enamelled iron troughs and dishes are to be obtained very cheaply, which are eminently suitable for washing and fixing prints; moreover, they are easily cleaned with a little common salt, and not liable to fracture.

Having put up a bench for toning, fixing, and washing, the remaining space may be utilized for mounting, finishing, and storage.

A PHOSPHORESCENT TABLET AS A STANDARD LIGHT.

BY ARNOLD SPILLER.

MR. BRIGHTMAN'S communication to the Bristol Photographic Society, on "The Effects of Temperature on Sulphide of Calcium," suggested to me that it would be interesting to determine the varying amount of light radiated at different temperatures by a phosphorescing surface. For the purpose of making the determination, one side of a flat tin vessel was coated with luminous paint, so that by pouring water of the requisite temperature into the tin, and inserting a thermometer, the temperature of the luminous surface might easily be ascertained. To measure the light, a gelatino-bromide film was placed behind a sensitometer, consisting of different thicknesses of gelatine varying from one to twenty-five. The following was the mode of working:—The tin was first filled with a freezing mixture consisting of ammonium chloride, potassium nitrate, and water, and when the thermometer registered 0° C., the painted surface, after being wiped dry from the condensed moisture, was insolated by burning one inch of magnesium ribbon near to it. After one minute had elapsed from the time of insolation, the sensitometer containing the gelatino-bromide film was exposed for half-a-minute against the phosphorescent surface. The experiment was thus repeated nine times, the freezing mixture being replaced by water varying from 10° to 80° C., and after the exposures had been made, all the gelatino-bromide films were placed in the same developer. On examination after development, the gelatine films all showed the same shade on the sensitometer, proving that the same amount of light was radiated whether the luminous surface be at 0° C. or 80° C. At the time I was much puzzled to account for this result, for it is a well-known fact that when a phosphorescing tablet is heated, the light increases in brilliancy *pro. tem.* However, on reconsidering the matter, I discovered that there was one difference between my experiment and that of Mr. Brightman's; for while the latter experimenter heated the luminous surface after insolation, I heated the phosphorescent tablet to the required temperature *previous* to insolation.

To confirm my previous result, I coated four glass test-tubes externally with the phosphorescent paint; into one tube was placed hot water, and into another a freezing mixture; all four tubes were then exposed simultaneously to the light of burning magnesium. On examination, after the lapse of a few seconds, it was found that the tube containing the freezing mixture gave out as much light as that which was treated with hot water; then, into the two empty but luminous tubes were placed hot water and freezing mixtures respectively, with the result that, while the heated surface increased in brilliancy, the cool surface slightly decreased. This conclusively proved that the one (apparently trivial) variation in the mode of conducting the experiments made all the difference in the result.

Having discovered this fact, I set about to account for it; but at first was unable to do so, until, after repeating the last-described experiment, I observed the tubes half-an-hour or so after the insolation, and found that while the two tubes containing the cooling mixture were still phosphorescing, those which contained the hot water were almost non-luminous. This result at once accounted for the phenomenon, and proved that *a phosphorescent surface is capable of absorbing varying amounts of light at different temperatures; the lower the temperature, the greater the amount of absorption.**

The above experiments also prove, in opposition to Mr. Brightman's statement, that a phosphorescent plate may be used as a standard light, provided that the exposure be made within a few minutes of insolation, and the temperature of the tablet remains constant between insolation and exposure.†

After making the above experiments, I find that Mr. Warnerke has already noticed the same phenomenon; but on describing my results to several photographers, they have all expressed their opinion that the phenomenon is not generally known, and therefore I venture to think no apology is needed for re-publishing experiments which, although not new, appear to have been overlooked by some photographers who are in the habit of using the Warnerke sensitometer; and this communication may help to reinstate it in public estimation against the rumour that it is "utterly unreliable."

Review.

THE NEW EDITION OF HARDWICH'S PHOTOGRAPHIC CHEMISTRY—*Continued.*

WHEN reviewing the work a fortnight ago, we promised to give further extracts. The following particulars respecting the collodion transfer process will be read with interest.

The collodion for transfers may consist of any good negative collodion which has been prepared for several months—for the older it is, up to a certain stage, the cleaner will the enlargement be. But a good negative collodion is unsuited for transfer work until it has been diluted by the addition of from one-third to an equal part of plain uniodized collodion. The object of this is to ensure a fine soft gradation of tints, from the highest light to the deepest shadow. The following is a formula by which several thousands of gallons of transfer collodion have been made, and which, in the hands of intelligent manipulators, yields pictures of the highest excellence.

To twenty-five ounces of plain collodion, containing about seven or eight grains of pyroxyline per ounce, add a bromo-iodiser, composed of the following:—

Iodide of cadmium	65 grains
,, of ammonium	25 ,,
Bromide of cadmium	19 ,,
,, of ammonium	11 ,,
Alcohol	5 ounces

Provided a good sample of soluble cotton has been obtained, this forms a transfer collodion which fulfils every requirement. It is desirable to add to it so much of an alcoholic solution of iodine as to impart a deep sherry colour, although this is not required if the collodion be allowed to stand for a few months after mixing before being used. It is always desirable that transfer collodion be made in large quantities, because by keeping for a few months, or even over a year, it acquires a charming ripeness that cannot be imparted by the admixture of iodine or bromine. Absolutely bare glass in the highest lights is an indispensable condition in collodion transfers.

The silver bath should not exceed twenty grains to the ounce.

The exposure must be determined by experience. If the negative be placed so as to be backed by blue sky, the exposure will be longer than if white clouds formed its backing; and if pyrogallic acid be employed as a developer, the exposure will have to be much longer than in the case of protosulphate of iron. With the former, from five minutes upwards may have to

* This phenomenon is analogous to the solution of gases in water, for the colder the water, the greater the amount of gas dissolved.

† In the instructions issued with the Warnerke sensitometer, it is especially pointed out that the phosphorescent tablet must not be touched with warm fingers after insolation.