

**THE PHOTOGRAPHERS'
BOOK OF PRACTICAL
FORMULAE**

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The photographers' book of practical formulae by W. D. Holmes & E. P. Griswold

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W. D. HOLMES & E. P. GRISWOLD

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 FORMULAE.

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COMPILED BY

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DEDICATED
TO
THE PHOTOGRAPHERS
OF
AMERICA.

PREFACE.

In presenting this work to the public the Editors desire to say that their chief aim has not been to procure new matter, so much as to compile all the old formulæ now in successful daily use, and publish them in such form that they may be conveniently referred to.

Through the courtesy of many eminent photographers, amateur and professional, we are also enabled to provide many things new and useful.

We believe that our efforts will be appreciated, realizing that we have accomplished a good work.

WEIGHTS AND MEASURES, PART AND PER CENT.
SOLUTIONS.

BY W. D. H.

In all photographic manipulations it is first necessary to understand most thoroughly the systems of weights and measures at present in vogue. More confusion has arisen from a lack of this knowledge, perhaps, than from anything else in the art of photography.

We are unluckily cursed with four different systems of weights—Avoirdupois, Troy, Apothecaries' and the Metric system—and these are often used indiscriminately by authors and those who compound formulae, and the formulae generally given forth without stating which set of weights is to be taken as the standard. As a matter of course the metric system cannot be mistaken for any other; so it is with the first three that we have to deal. While in general practice, the avoirdupois, Troy and Apothecaries' weights are nearly enough alike to cause no very serious error in compounding our chemicals, still there can be no accurate results reached by those who are desirous of working by strictly correct weights, and who have sufficient chemical acumen to analyze their work.

So far as we know, the writers who specify what weight shall be employed can be counted on ten fingers. The makers of dry plates are also at fault, and we can call to mind but one or two instances where a definite statement is made by them.

It has been a matter of some thought to the editors of this book as to the best means of indicating what system is used, and whether the formulae be avoirdupois or apothecaries' weight.

Where necessary, and to avoid all ambiguity, it has been decided to precede the formula with the name of the system given in full, thus: avoirdupois or apothecaries' weight, in all cases where it is definitely known.

As a matter of course the grain is the same in both systems.

It has been thought best to omit the avoirdupois *drachm*, as tending to confuse, and whenever necessary to substitute grains.

Troy weight is practically the same as apothecaries', the only difference being that the *pennyweight* is used. Of this weight we shall not treat, as but few use it, and only in weighing precious metals. The table is inserted in its proper place, but no reference to it will be found in any formula.

There are numerous formulae, many of them valuable, which do not indicate the weight intended. Therefore we must leave these to the judgment of the reader.

We presume it is generally understood that chemicals are sold by avoirdupois weight, so that in using, say, Pyro, remember that the ounce contains only about $437\frac{1}{2}$ grains. Do not take it for granted that, if you purchase an ounce of anything, you will receive exactly $437\frac{1}{2}$ grains. One of the editors weighed an ounce of hydroquinone recently and found he had 463 grains.

Could the photographers of America be induced to adopt the Metric system, it would greatly simplify the compounding of all chemicals. It is not employed in this work because we do not think the country is ripe for it. But it is very easy to familiarize one's self with it. There is a very excellent little scale sold by, we believe, the

Fairbanks Co., which has two bars for the weights to slide upon. One is graduated in grains and drachms (apoth.) and the other in grammes. After taking the weight desired by apothecaries' weight, take it in grammes, and it will not be long before one system becomes as familiar as the other. By the tables in the Appendix, it is easy to change from one to another.

One fluid ounce of water at 62° Fahrenheit, in open air, weighs 437½ grains (437.481 exactly). Weighed at the same temperature in vacuum, 437.9 grs. (437.94195 exactly.)

So it will be noted that one fluid ounce of water corresponds with the avoirdupois ounce. But while this is theoretically the case, it is rarely so in practice, owing to the fact that all except distilled water is more or less charged with impurities. Graduates are rarely perfect. It is well to remember these facts when compounding *part* solutions.

The English pint and the American pint differ to the extent of four ounces. In England it is 20 fl. oz., and in America 16 fl. oz. Therefore an English gallon contains 160 fl. oz., unless *wine* measure is specified, while an American gallon contains 124 fl. oz. In using English formulæ we shall designate them as such, and the American by the ordinary abbreviations only.

Part solutions we regard as exceedingly troublesome things to compound, from the fact that unless otherwise expressly stated everything has to be done by weight, and the amount of trouble in calculating the tare of the various vessels employed is very great.

For example, let us suppose that a formula directs us to prepare a solution thus :

Water,	8 Parts.
Alcohol,	2 "
Pyro,	1 "

To take 8 fl. oz. Water, 2 fl. oz. Alcohol, and 1 oz. Pyro would be obviously incorrect. The 8 fl. ounces of water would be nearly right, but the 2 fl. ounces of alcohol would be in the neighborhood of 1.6 oz. real weight. Consequently we must weigh each of the three to arrive at an exact result. For these reasons we are opposed to *part* solutions, in photographic practice, at least. Few photographers have such apparatus as will give you accurate results.

Per cent. solutions have received a great deal of notice in several photographic journals recently.

One of the editors of this work, in a spirit of curiosity, began an inquiry among chemists and druggists as to what in their view constituted a 10 per cent. solution. Very much to his astonishment *seven* different formulæ were discovered in one day, varying as much as 43.5 grains to the ounce of solvent. He embodied these results in a communication to the *Photographic Times* and succeeded in stirring up a veritable hornet's nest among photographers generally.

Our modesty forbids us giving any especial formula for compounding a *per cent.* solution lest we be seized upon by some man, told what is the right thing, and that there is no use to differ, as his result is final. Consequently we withdraw from that field, and trust by the time we have another work in prospect, abler minds than ours shall have solved the problem and put it into such shape that our scissors can attach it.