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THE
WARREN
MONTHLY



Containing an Article on

**Duochrome or Two-Tone
Inks**

By **CHARLES F. CLARKSON**

Sales Manager of
Charles Eneu Johnson & Company
Manufacturers of Printing and Lithographic Inks
Dry Colors and Varnishes

January - 1922

*Concerning the Use of Duochrome Inks on
Warren's Cameo and Warren's Silkote*

Printers know that duochrome or two-tone inks give especially beautiful results on Warren's Cameo and Warren's Silkote. The absorbent surface of these papers makes possible the fine effects, but this same feature makes it difficult to control the results. Paper to be used in printing with duochrome inks should be sold with the distinct understanding that neither the S. D. Warren Company nor its distributing branches can guarantee the results. This article makes the reason clear.—*Editor.*

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Duochrome or Two-Tone Inks

CHARLES F. CLARKSON

Sales Manager of Charles Eneu Johnson & Company

SOMETIME past I received a copy of a catalog printed by one of the large printers of the Middle West with the request that I explain the variation in the "color" shown on each of the signatures comprising the finished book. "It must have been caused by negligence of the ink manufacturer; the ink he sold me was not uniform; or, maybe it's the paper manufacturer's fault," he coached me to answer, and finished his letter with, "I did not get the ink from your house" but "I'll know better next time."

MY! what a temptation to apply some of the "arts" of the so-called salesman. Here was a man, not seeking the truth, not seeking the knowledge which would, perhaps, lessen the possibility of another dissatisfied customer at some future date, but attempting to put in my mouth the words of my answer to his question, and help him "pin" on the ink or paper manufacturer the amount that the dissatisfied customer proposed deducting from his bill.

The matter seemed of sufficient importance to justify considerable trouble and expense on our part in order to explain in detail the exact causes of his complaint.

I know of no better way to render a service to the printing industry at large than to elaborate just a little and offer my answer to this printer as a contribution to this issue of THE WARREN MONTHLY.

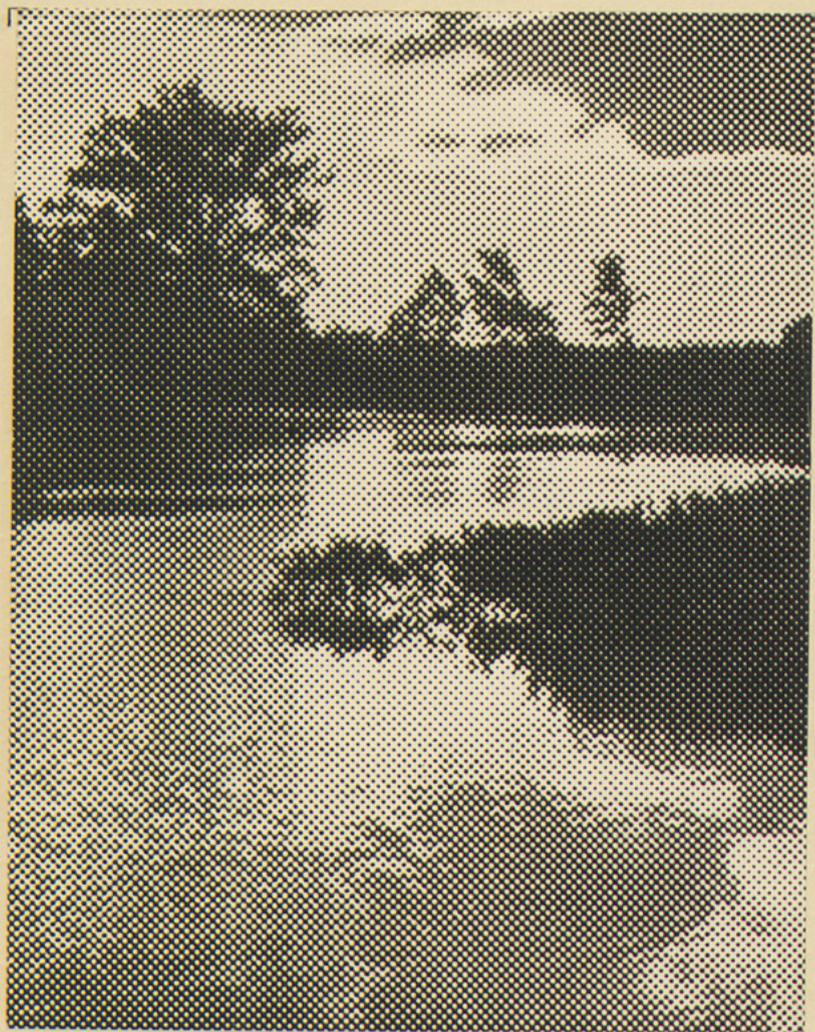


Fig. 1

Duochrome 87. Printed on Cameo. Dried at usual pressroom temperature, 75° Fahrenheit.
All other conditions identical with example Fig. 2

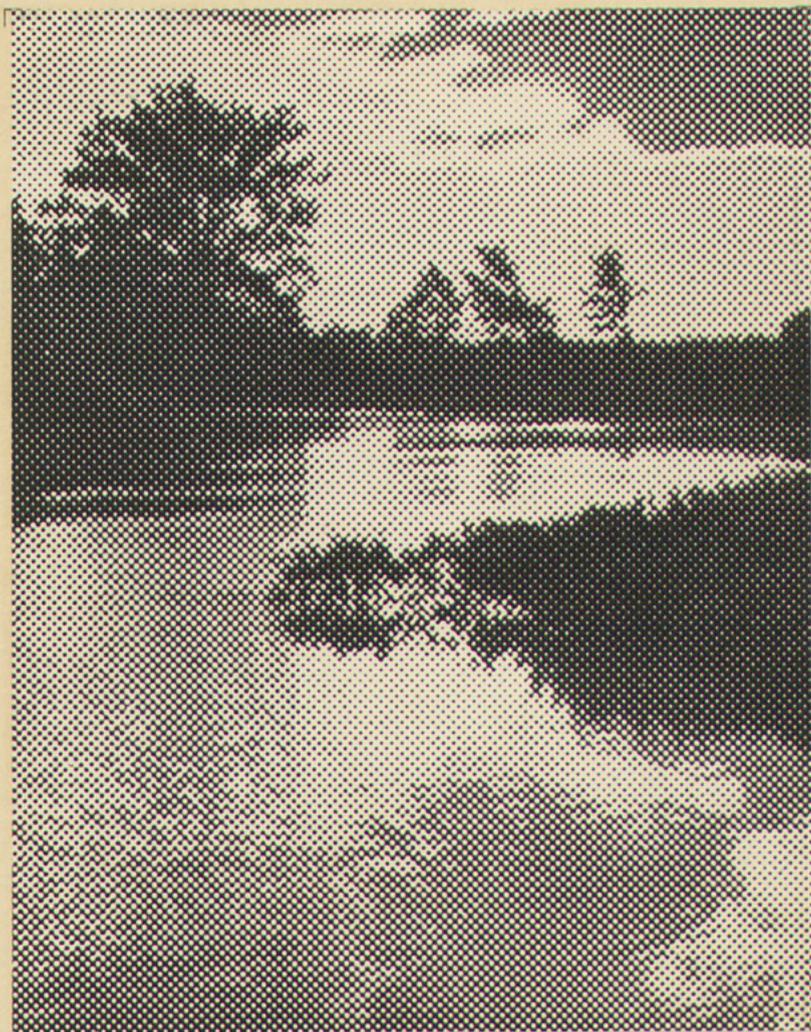


Fig. 2

Duochrome 87. Printed on Cameo. Dried at 10⁰ Fahrenheit. All other conditions identical with Fig. 1

The job was printed with duochrome or two-tone ink on Cameo paper—an attempt to handle these two materials in the ordinary commercial way.

It is not enough to say that Cameo paper or duochrome inks were never intended for use in the production of the ordinary commercial job handled in the usual commercial fashion, even though the attempt usually results in almost a desecration of the art for which they were intended.

We must show the causes. In order to do so it will be necessary to describe in detail the construction of duochrome inks, as well as some of the chemical reactions, physical and mechanical actions which take place before, during and after the application of this type of ink to Cameo or other absorbent papers.

If our analysis is to be of value, we shall have to offer counsel, as we proceed, on how to avoid some of the disappointments resulting from the attempt to use these materials under any but the most favorable conditions by capable men who are familiar with the correct methods for handling materials of this nature. We shall also call attention to some conditions which are to be expected, and which are, because of the chemical and physical nature of the ink in question, absolutely uncontrollable.

First: The two-tone effect of duochrome ink is produced by the "bleeding out" of the free stain which is one of the components of inks of this character. This stain is a dye dissolved in a non-drying oil. Particular cognizance must be taken of this fact in order to understand fully the action which causes the two-tone effect of these inks and the variations of the degrees of this effect on different paper surfaces. (See Figures 1 and 2.)

This stain never actually dries, but rather spends itself by being absorbed by the stock. (The fact that some papers are more absorbent than others makes it obvious that the development of the two-tone effect will be of a higher degree in one paper than in another.) Cameo, being of an excep-

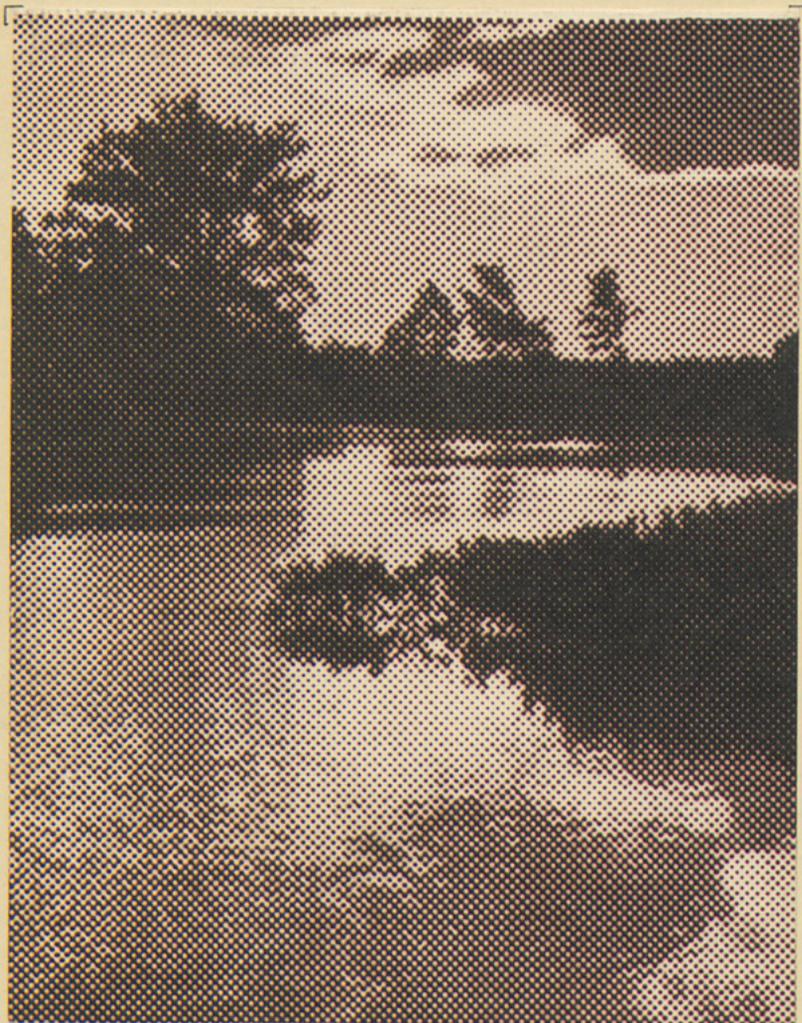
tionally absorbent nature, develops to a considerable degree the two-tone effect.

Some are of the opinion that the ordinary printing ink is a dye or color actually dissolved in varnish, and because the writer has so often heard this opinion expressed, it will perhaps be well to digress somewhat at this point to describe the construction of this material.

Printing ink of the ordinary type is a pigment ground (not dissolved) in varnish. In the case of color ink the pigment is a dry color which may be a precipitated dye, an organic or inorganic chemically-made color, or one of the colors derived from the mineral world. In the case of black ink the pigment is principally carbon black.

The varnish holds the atoms of pigment in suspension and serves as the vehicle which carries them from the distributors to the form rollers, and thence to the plate or type to be printed, and finally to the paper where it also serves as a binder. It is important that the specific gravity of the pigment or dry color, and the viscosity of the varnish or vehicle, be in correct balance and in proper relationship to the paper on which the ink is to be applied. Most of the troubles, such as ink not drying on the paper in the ordinary time allowance, picking of the paper surface, drying on the press, "chalking off" after drying, "smudging" on the folders, "gathering" on the "angle bars" and "what-not," are caused by improper consideration, on the part of the ink manufacturer or the printer, of the factors of balance between specific gravity and chemical nature of pigment, viscosity of varnish and their relation to the paper or job, and the conditions of application.

Add a given quantity of oil soluble stains of a non-drying nature to the ordinary printing ink and we have a two-tone or duochrome ink. The second tone is produced by the "bleeding out" of the oil soluble stain from the varnish and pigment which gives the body or major tone to the impressed surface.



Example 1-A

An example of duochrome ink, stain content and halftone screen greatly exaggerated. Note the light brown halo around each dot. Examination under a magnifying glass will show the effect more clearly. The black and shadow tones are almost completely filled in by the bleeding of the stain. This being due to the greater quantity of ink area covered in comparison with light tones. Examination of the reverse side of the sheet will show bleeding of stain through the sheet



Example 1-B

An example of ordinary printing ink in comparison with duochrome ink. Halftone screen and stain content of duochrome ink greatly exaggerated
Left half printed from ordinary printing ink. Right half printed from same ink with stain added

We illustrate this with the use of a very much enlarged halftone screen and an ink with a proportionately exaggerated stain content. The light brown halo around each dot is the free stain which has been absorbed by the paper. The dot is the impression of the pigment and the varnish which compose the ordinary printing ink. (See Example 1-A.)

This, it seems to the writer, presents in the main a comparatively "easy to understand" demonstration of the action of duochrome inks. However, in order that the differences between the ordinary printing ink and duochrome inks may be more easily understood, we present the same coarse screen plate made in two parts to register. On one-half we have printed the ordinary printing ink; on the other, the duochrome ink or the one with the free stain added. Thus, with the two so closely compared, one gets a good idea of the difference in the effect of the duochrome ink in comparison with the ordinary ink. (See Example 1-B.)

So far in our analysis we have shown nothing which would indicate the difficulties or uncontrollable factors which we mention in our introduction, except to call attention to the greater or lesser development of the two-tone effect in duochrome inks on the various paper surfaces.

We go still further and illustrate this by the use of the coarse screen halftone and the same ink on Cameo and Cumberland Super — note the difference. (See Figures 3 and 4.)

It must be understood that these two surfaces present two extremes. We use them to show more clearly the points we desire to impress, *i.e.*, different paper surfaces will produce a very different result, and even though the difference between the surfaces which are more closely related would perhaps not be so great, the difference will be great enough to be very noticeable and often sufficient to cause much disappointment with the finished product. When we add the other controlling factors which have not been mentioned heretofore, it is readily understood that uniformity is only

possible after the most careful consideration of all the conditions.

Temperature, humidity, quantity of ink carried, make-ready, condition of rollers, setting of rollers, seasoning of paper, depth of the etching, size of sheet, piling of printed sheets, and lighting of pressroom are all factors of importance and will figure in the uniformity of the finished product.

Let's consider why and how they control the development of the two-tone effect.

First: All the above are factors which have something to do in a greater or lesser degree with the rapidity of drying.

If the drying action of the vehicle or varnish is unduly fast, the development of the stain is considerably retarded, due to the fact that the oxidization of the varnish causes the formation of a very tough film which will not permit the escape of the stain. It being held in a pocket, "as it were," not allowed to come in contact with the paper surrounding each halftone dot, and, consequently, cannot be absorbed.

Temperature, humidity and piling of paper are, perhaps, the most important of the governing conditions mentioned above as far as the factor of drying is concerned. However, it must be understood that they are all important.

It is easy to understand that a small quantity of ink will dry faster than a large quantity. A fact perhaps not always realized but nevertheless true, makeready has a great deal to do with the amount of ink it is possible to carry, and the condition and setting of rollers also figures largely in this respect, as would depth of the etching.

The size of the sheet is frequently the cause of lack of uniformity in the appearance of various pages of the job. The difference in the amount of oxygen accessible to the outside of a large pile, and the middle of the pile, would make a material difference in the setting and drying time, and the two-tone development would be governed accordingly.

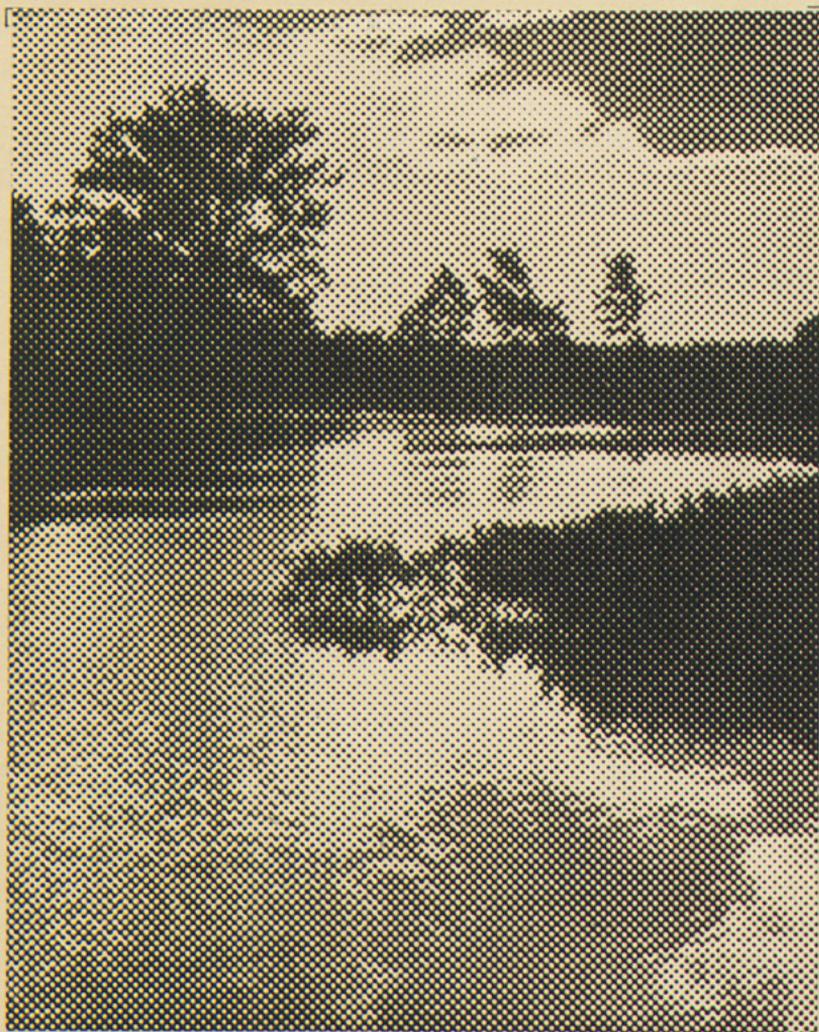


Fig. 3

Duochrome No. 87. Printed on Cameo. Dried in pressroom temperature. All conditions identical with example shown on Cumberland Super. Compare with Fig. 4

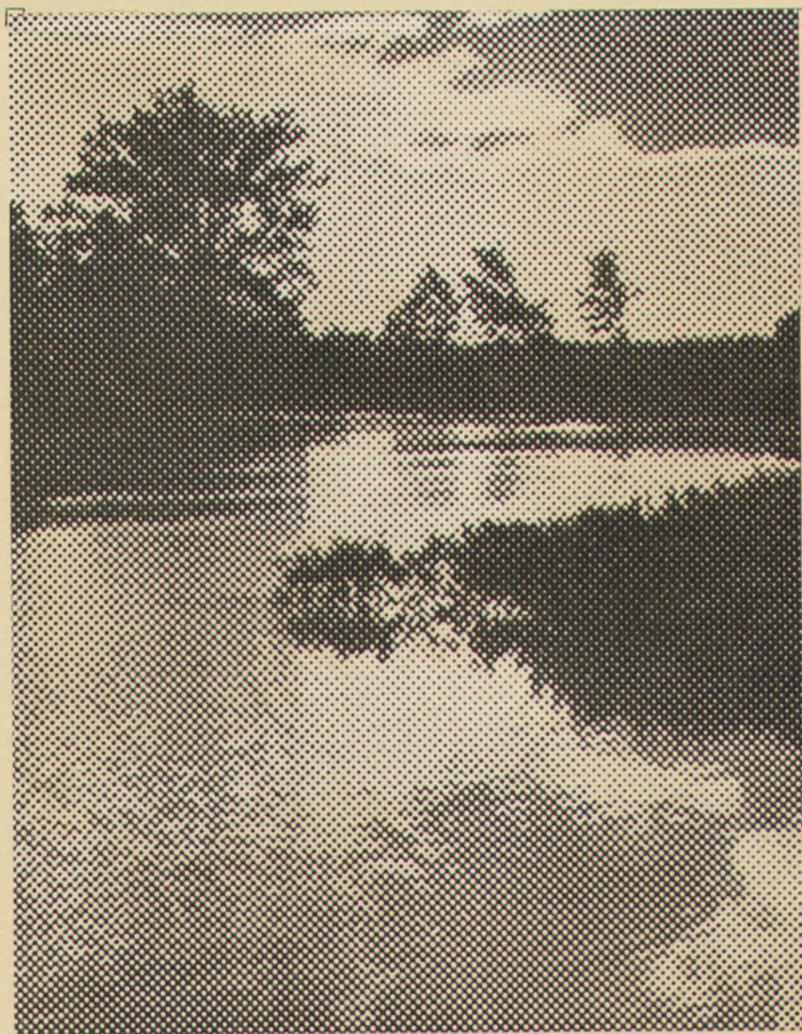


Fig. 4

Duochrome 87. Printed on Cumberland Super. Dried in pressroom under conditions identical with example on Cameo. Compare with Fig. 3

Condition and setting of rollers perhaps is even of greater importance in the use of duochrome inks than ordinary inks, due to the fact that the stain content has a tendency to destroy somewhat the carrying properties of the vehicle.

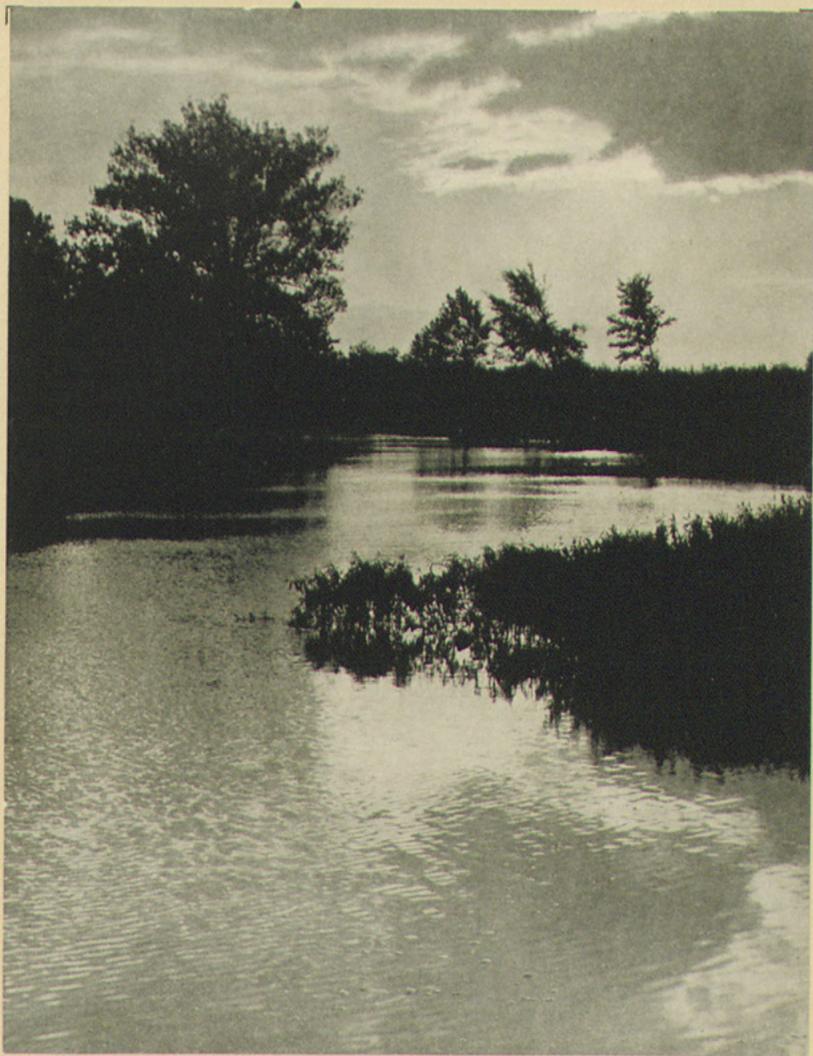
Reference is made to this factor in detail farther on in this article.

The lighting of the pressroom does not figure seriously except in extreme cases. However, it is important enough to justify consideration. The stain used in duochrome inks is usually extremely fugitive. The writer does not entertain the slightest doubt regarding the finished product showing a materially different tone if printed and dried in a very dark pressroom as compared with an exceptionally light one. Slip-sheeting with the use of duochrome inks is invariably necessary due to the fact that the bleed is almost as likely to transfer to the sheet above as it is to act on the sheet on which it is printed. Inspection of illustration, example A-1, which shows bleeding of the stain through the sheet, conveys an idea of what might be expected in this connection. In fact, a positive, predetermined result is next to impossible of accomplishment with the use of duochrome inks on any kind of paper, and this is doubly so with soft-surfaced, absorbent papers.

Since all of the foregoing conditions bear such important relationship to the finished product, it is plain that it would be impossible to duplicate a given result at any time. What the result would be if an attempt were made to change from one manufacturer's paper to another, even though they be of the same general class could, of course, be only a guess.

Duochrome inks, as a general rule, are not as good workers as the ordinary ink, due to the fact that it is necessary to give consideration to the non-drying and reducing properties of the oil soluble stain.

We attempt to design, in the first place, a basic ink of a consistency which will have the greatest margin of drying



An example of careful printing with Duochrome 87 on Cameo paper.

and carrying safety so as to counteract, in a measure, the opposite properties of stain.

I cannot resist the temptation to mention one of my early experiences with the use of a duochrome ink because it serves as a parable.

A printer desired to submit to a customer a proof showing the results obtainable with duochrome ink. Instructions were sent to the pressroom in their usual course. After proper selection of the subject the proof was made—a perfect work of art, duochrome ink on Cameo paper. The printer was so much pleased that he called in the salesman who was to be selected to sell the job, and both were filled with the kind of enthusiasm which sends a man home sure that he can go out the next day and “sell the world.” In order that they would know just where to find the proof the next morning, it was carefully wrapped and “laid in state” on the convenient steam radiator.

When the salesman took a last peep in the morning he was more pleased and enthusiastic, if such a thing were possible, than on the night before.

“Can you duplicate this result exactly?” said the buyer. “Surest thing you know,” quoted the salesman, and, the contract was signed.

Plates were made, type was set, paper and ink were purchased, instructions “bang-up job” inscribed on the face of the order.

What havoc those twelve hours on the radiator had wrought!

Bless the poor ink man! How he tried, and, believe me, please, reader, I know. The picture of that fracas between the Warren distributor, the printer, the customer and the ink man is still very clear.

The fact that I desire to bring out is that the only method by which the original proofs could have been duplicated—that one was, if not impossible—certainly far from practicable; namely, drying the ten thousand sheets under con-

ditions which would approximate very closely "the twelve hours on the radiator."

I wonder if I am leading the reader to believe that duochrome inks are a print shop "bug-a-boo." This is far from my intention. I have seen reproductions of some of the medieval masterpieces printed with duochrome inks and so well done that only an expert could distinguish between original and duplicate; I have also seen very fine de luxe catalogues printed with duochrome inks, and whenever one comes to my attention, I find myself murmuring, "*Executed by a careful, exacting printer under the best conditions and at a price commensurate with the result.*"

Printed on Warren's Olde Style India 25 x 38 — 80
with Charles Eneu Johnson & Company's Olde Style Black Ink

July 2016

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