

# UNITED STATES PATENT OFFICE

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## PERMANENT BRILLIANTLY COLORED WRITING FLUID

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The object of this invention is to produce a per-  
manent brilliantly colored writing ink suitable  
for fountain pens.

For many purposes, it is highly desirable that  
writing ink have a brilliant and pleasing color.  
This color is usually obtained by the use of syn-  
thetic dyes. However, inks made with dyes alone  
do not have sufficient fastness to light nor per-  
manence to warrant their use on legal documents  
or other papers, the writing on which is expected  
to last for considerable time, permanence being  
defined as the keeping quality of ink after it has  
been applied to paper. Writing made with such  
ink will fade on long exposure to sunlight or even  
after paper containing it has been stored for many  
years.

Permanence in inks containing dye as the prin-  
cipal coloring constituent is frequently accom-  
plished by the use of the iron tannates which pro-  
duce a black color in writing after the dye has  
faded. However, even the black iron tannate will  
eventually fade by oxidation of the tannins, leav-  
ing on the paper brown iron oxide as is often seen  
in specimens of old writing. Furthermore, the  
iron salts precipitate and render insoluble many  
dyes which are highly desirable for use in inks.  
Also, the iron salts and iron tannate combina-  
tions dull the brilliant color of many dyes and ren-  
der them useless for inks. Other metallic sub-  
stances are and have been used to produce per-  
manence in inks, among which may be mentioned  
chrome-logwood colors, Prussian blue, and aliz-  
arine-iron lakes. All of these have a deleterious  
action on the color stability of dyes in inks.

I have discovered that inks applied to paper  
can be made much more permanent and resistant  
to light if certain soluble metallic salts are added  
to the ink which produce colored oxides or decom-  
position products after exposure to light. For  
example, if I include in my ink .5 of a percent  
of ammonium meta vanadate, the permanence is  
increased very greatly, since, as the dye fades  
under the action of light, the vanadate decom-  
poses, producing a brown residue which makes  
the writing legible even when it has been exposed  
to light so long that the dye has completely faded  
away. In addition to vanadates, other soluble  
metallic salts may be used such as vanadyl chlo-  
ride, ammonium tungstate, potassium ferro- and  
ferri-cyanides, copper sulphate and nickel sul-  
phate, providing they have no deleterious ef-  
fect upon the dyestuff or other ingredients used  
in the ink. The permanence produced by these  
metallic salts is comparable with that produced  
in iron tannate inks by iron salts.

In case the writing containing these metallic  
salts has so completely faded that only a faint col-  
or of metal oxide remains on the paper, the writ-  
ing can be restored to a more legible form in  
known ways. For example, by chemical treat-  
ment with hydrogen sulphide or tannic acid to  
produce a more deeply colored writing.

The amount of metallic salt to be used may be  
varied within wide proportions depending upon  
the degree of fastness required and the composi-  
tion of the ink. For example, in order to meet  
the specifications for Government standard writ-  
ing ink with respect to the minimum content of  
metallic iron (see circular Bureau of Standards  
#95, (1925) "Inks, typewriter ribbons and carbon  
paper", page 6), I may use 22.7 grams of po-  
tassium ferro-cyanide per liter of ink which is  
equivalent to the minimum requirements of 3.0  
grams of metallic iron or 15 grams of ferrous sul-  
phate per liter. In the case of ammonium meta  
vanadate, I find from 3.5 to 7.0 grams per liter  
produces satisfactory results.

I prefer to use ammonium meta vanadate in  
my inks since it is easily soluble, is colorless in  
solution, has little effect upon most dyes in solu-  
tion, and develops a deep brown color on paper  
under the fading action of light. Other mate-  
rials known to the art such as gums, perfumes,  
introfiers, flow promotors, fungicides and hydro-  
scopic agents may be added to modify the writing  
properties of the inks, more especially for foun-  
tain pen use. In my inks I have found it con-  
venient to use thymol and phenol or salicylates as  
fungicides, and ethylene glycol is used as a hydro-  
scopic agent to keep the point of the pen moist  
when exposed to the atmosphere.

I present below typical formulae which produce  
excellent inks of the type specified:

### Green ink

Naphtaline green, highly conc. (Color Index  
No. 735, Schultz No. 564.)  
Ammonium meta vanadate  
Thymol  
Phenol  
Ethylene glycol  
Water

### Violet ink

Pontacyl violet 4BL (Color Index No. 698,  
Schultz No. 530.)  
Ammonium meta vanadate  
Sodium salicylate  
Thymol  
Ethylene glycol  
Water

*Red ink*

	Eosine Y Ex. conc. (Color Index No. 768, Schultz No. 587.)	naphthalene green, highly conc. (Color Index No. 735, Schultz No. 564.), ammonium meta vanadate, thymol, phenol, ethylene glycol and water.	
5	Ammonium meta vanadate	2. A writing fluid comprising in solution pontacyl violet 4BL (Color Index No. 698, Schultz No. 530.), ammonium meta vanadate, sodium salicylate, thymol, ethylene glycol and water.	80
	Phenol		
	Thymol		
	Ethylene glycol		
	Water		
10	Having described my invention, what I desire to claim and secure by Letters Patent is:	3. A writing fluid comprising in solution Eosine Y Ex. conc. (Color Index No. 768, Schultz No. 587.), ammonium meta vanadate, phenol thymol, ethylene glycol and water.	85
	1. A writing fluid comprising in solution		
		G. H. SAYLER.	
15			90
20			95
25			100
30			105
35			110
40			115
45			120
50			125
55			130
60			135
65			140
70			145
75			150