

FASTNESS OF DYED FABRICS TO DRY CLEANING

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ABSTRACT

Data on the behavior of dyes in actual dry cleaning have not been available. It is the purpose of this paper to supply this information.

A number of representative dyestuffs on wool, silk, cotton, rayon, and union fabrics were subjected to two tests. In the first a moisture-free solvent was used, and in the second the solvent contained 0.1 per cent free moisture and 0.01 per cent alkali. The apparatus used in making the tests was designed as a convenient substitute for a commercial dry-cleaning machine. The results are given in tabular form.

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I. INTRODUCTION

The fastness of dyestuffs to most of the agencies and operations entering into the dry-cleaning process has already been established. The behavior of dyes on fabrics toward acids, alkalis, steaming, pressing, and ironing is known and can be ascertained from the catalogues of the dye manufacturers. The action of dry-cleaning solvents and soaps on dyed fabrics has not been systematically studied.

It is probable that any type of dyestuff will at one time or another be used on textile materials which will be subjected to the dry-cleaning process. The dye may occur on the principal fabric or on the linings, threads, or decorative effects on garments or household materials which are customarily dry-cleaned. A slight change in color resulting from dry cleaning would not be particularly serious in some instances, but any tendency to bleed is always a potential danger because of the liability of staining other materials in the same load.

This study of the action of dry-cleaning solvents and soaps on dyed fabrics was undertaken by the research associate at the bureau from the National Association of Dyers & Cleaners at the request of the association. It may well be stated here that, on account of the hundreds and even thousands of dyed materials handled every day in dry-cleaning plants, it was not considered practicable to study any

procedure whereby the dry cleaner would attempt to group the dyed materials into their respective fastness or dyestuff classes. In some plants it is customary in the prespotting operation to test for the presence of basic dyes on certain kinds of materials before applying spotting agents. It is believed that data obtained from this systematic study of the effects of dry cleaning on dyed fabrics will be useful not only to the dry cleaner, but also to the dyestuff manufacturer and to the fabric dyer.

II. PURPOSES AND SCOPE

The purpose of this study was to test the fastness of dyed fabrics (*a*) to dry-cleaning solvents and soaps, and (*b*) to dry-cleaning solvents and soaps to which small amounts of water and alkali were added.

Many dyestuffs are identical in composition but are sold under different trade names by the various companies. To test all dyes manufactured would thus have involved needless duplication and would have served no useful purpose. Accordingly, American manufacturers were requested to submit sample dyeings of the types of dyes in which they specialized, together with dyeings of the dyestuffs which they made exclusively. In a few instances, as will be noted in the tables, duplications occurred; but these served as check tests. It is to be noted that only American dyestuffs are included; an attempt to obtain dyeings from a large importer of foreign-made dyestuffs was not successful.

III. ACKNOWLEDGMENTS

An acknowledgment of appreciation for whole-hearted interest and cooperation is extended to the dye manufacturers¹ who provided the sample dyeings. Thanks are also due C. W. Schoffstall, formerly chief of the textile section, for his helpful suggestions.

IV. APPARATUS

The apparatus used in making these tests is pictured in Figure 1. The machine was designed as a convenient substitute for a commercial dry-cleaning machine. It has a capacity of six 1-liter bottles. The rotor is mounted on a shaft so geared to a motor that the rotor has a speed of 30 revolutions per minute. The bottles are corked and are held in position by a spring clamping lock. The bottles rest securely in holes countersunk in the base of the rotor.

¹ American Aniline Products Co.; Geigy Co. (Inc.); John Campbell & Co.; Celanese Corporation of America; E. I. Du Pont De Nemours & Co.; National Aniline & Chemical Co.; Newport Chemical Works (Inc.); Zinsser & Co.

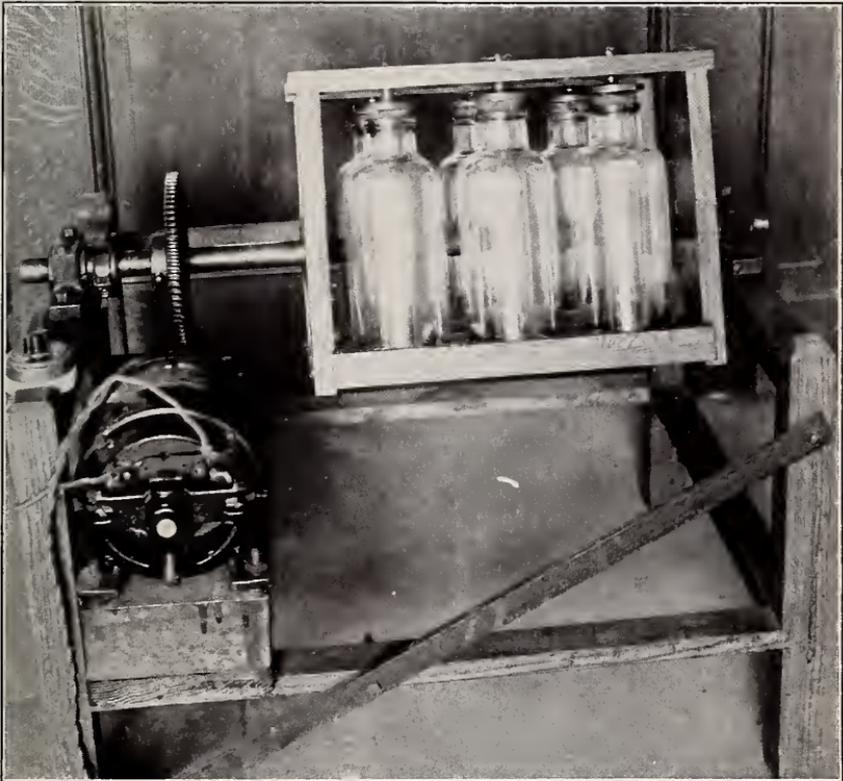


FIGURE 1.—*Machine for laboratory dry-cleaning tests*

V. TESTING PROCEDURE

Two series of tests were made. In the first the solvent was moisture free. The soap solutions prepared from this solvent contained only the small amount of moisture naturally present in the soaps. In the second series the solvent contained 0.1 per cent water and 0.01 per cent sodium hydroxide. The soaps were prepared with the solvent containing these amounts of water and alkali. Although this content of water and alkali may appear excessive, analyses of several samples of solvents received from various cleaners showed that the use of solvents containing the above percentages is not unusual in practice.

A sample of dyed fabric 10 square inches in area was placed in each bottle, together with small portions (about $\frac{1}{4}$ square inch) of cotton, wool, rayon, and weighted and unweighted silk to be used in judging staining. In order to simulate to a close degree the mechanical action encountered in a dry-cleaning machine, four small pieces of toweling were placed in each bottle. Enough dry-cleaning solvent to cover the cloth, about 50 ml, was then added and the bottles placed in the machine. The solvent employed in this investigation was in strict conformity with specifications for Stoddard solvent.² The machine was run for 15 minutes. The bottles were then removed, the solvent poured off, and a 0.5 per cent solution of benzene soap having a potassium oleate base added. The machine was again run for a 15-minute period, at the expiration of which the bottles were removed and the soap solution poured off. A 0.5 per cent solution of alcoholic benzene soap was next added and the machine run for an additional 15 minutes. The bottles were removed and this solution poured off. The samples were finally given a rinse in solvent for 10 minutes, extracted, and dried for 45 minutes at 120° F.

The test procedure was repeated with fresh portions of the dyeings, using the solvent and soaps containing water and alkali. After the completion of each test, the portions of undyed fabrics were examined to determine whether or not they had become stained. The treated dyed sample was compared with the original untreated sample in order to detect possible color changes. Any coloration of the clear solvent or the soap solutions was noted at the end of each operation.

In Table 1 are listed dyes which showed no change either in moisture and alkali-free solvent or in solvent containing 0.1 per cent water and 0.01 per cent caustic soda. The dyes are divided into eight classes, namely, direct, acid, basic, mordant, sulphur, vat, developed, and ice. The dyes in each class behave similarly toward the same fiber, and the method of their application is, in general, the same. Descriptions

² Stoddard Solvent (Dry Cleaning), Commercial Standard CS3-28. Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents.

of these classes and methods of application can be obtained from any standard book on dyeing.

In column 1 are listed the serial numbers assigned for reference purposes in this study.

Column 2 contains the Colour Index numbers of the dyes obtained from The Colour Index published by the Society of Dyers & Colourists (England, 1924).

This index should be consulted for data on chemical structure, methods of application, properties, uses, patent references, and trade names. The Year Book of the American Association of Textile Chemists & Colorists lists the American manufacturers of these dyes by Colour Index number. The annual census of dyes of the United States Tariff Commission gives similar data.

Dyes which have been assigned no numbers in the Colour Index are listed by name only. The manufacturers of these dyes can be found by consulting the Year Book of the American Association of Textile Chemists & Colorists.

Column 3 contains the names of the dyes which were tested.

In column 4 are listed the various fibers which were dyed with the dyes tabulated in column 3. The letters "C," "W," "S," "WtdS," and "R" denote cotton, wool, silk, weighted silk, and rayon, respectively.

TABLE 1.—Dyes which showed no color change in either moisture-free and alkali-free solvent or in solvent containing 0.01 per cent caustic soda and 0.1 per cent water

DIRECT COLORS			
Serial No.	Colour Index No.	Name of dye tested	Fiber on which dyed
1		Amanil brown GR	C-S.
2	653	Amanil fast orange PRZ	C-S.
3	448	Benzopurpinc 4B Conc.	C-S-WtdS-R.
4	495	Benzopurpinc 10B	C-WtdS-R.
5	365	Chrysophenine Ex	C-WtdS-R.
6	401	Diazine black H Ex	R.
7	581	Direct black EG Ex	C-WtdS-R.
8	582	Direct black RB Ex	C-WtdS-R.
9	406	Direct blue 2B Conc.	C-S-R.
10	447	Direct blue 3BX	C-S-R.
11		Direct blue BXG	C-S-R.
12	401	Direct blue BH Ex Conc.	C-R.
13	508	Direct brilliant blue G	C-S-R.
14	512	Direct fast blue RW	C-S-WtdS-R.
15	420	Direct fast brown M	C-S-WtdS-R.
16	130	Direct fast pink EBN	C-S-R.
17	419	Direct fast red F	C-WtdS-R.
18	326	Direct fast scarlet 4BS	C-S-WtdS-R.
19	326	Direct fast scarlet 8BA	C-S-R.
20	326	Direct fast scarlet G	C-S-R.
21	326	Direct fast scarlet 4BAN	C-S-R.
22	814	Direct fast yellow NN	C-S-WtdS-R.
23	552	Direct navy blue RS	C-R.
24	520	Direct sky blue Ex	C-S-R.
25	518	Direct sky blue 6B Ex green	C-S-R.
26	590	Direct steel blue G Conc.	C-S-R.
27	394	Direct violet N	C-WtdS-R.
28	622	Direct yellow AFG	C-S.
29	581	Erie black BF	R.
30	581	Erie black GXOO	R.

C=cotton.

S=silk.

WtdS=weighted silk.

R=rayon.

TABLE 1.—Dyes which showed no color change in either moisture-free and alkali-free solvent or in solvent containing 0.01 per cent caustic soda and 0.1 per cent water—Continued

DIRECT COLORS—Continued

Serial No.	Colour Index No.	Name of dye tested	Fiber on which dyed
31	539	Erie black NR Ext.	R.
32	582	Erie black RF	R.
33	-----	Erie blue green CN	R.
34	-----	Erie bordeaux B	R.
35	596	Erie brown CN	R.
36	-----	Erie brown GB	R.
37	495	Erie cardinal 7B	R.
38	420	Erie fast brown 3RB	R.
39	-----	Erie fast gray M	P.
40	326	Erie fast orange A	R.
41	419	Erie fast red FD	R.
42	326	Erie fast scarlet 4BA	R.
43	326	Erie fast scarlet 8BA	R.
44	326	Erie fast scarlet YA	R.
45	814	Erie fast yellow WB	R.
46	128	Erie pink 2B	R.
47	448	Erie red 4B	R.
48	382	Erie scarlet B	W-R.
49	471	Erie violet 2B	R.
50	387	Erie violet BW	R.
51	394	Erie violet 3R	R.
52	365	Erie yellow Y	R.
53	873	Fast silk gray M Conc	C-S-R.
54	-----	Light fast blue SFR	C-S-R.
55	-----	Light fast blue SFF	C-S-R.
56	-----	Light fast blue 4GL	C-S-R.
57	319	Light fast heliotrope 2BL	C-S-R.
58	278	Light fast red 8BL	C-S-WtdS-R.
59	267	Neutral gray GG Spec	C-S-R.
60	405	Niagara blue 2B	R.
61	477	Niagara blue 3B	R.
62	552	Niagara blue DB	R.
63	405	Niagara blue HW	R.
64	468	Niagara blue 3RD	R.
65	512	Niagara blue RW	R.
66	-----	Niagara fast blue RL	R.
67	520	Niagara sky blue	R.
68	518	Niagara sky blue 6B	R.
69	581	Pontamine black EBN	S.
70	-----	Pontamine brilliant violet B	S.
71	598	Pontamine brown CG	S.
72	420	Pontamine brown R	S.
73	539	Pontamine fast black FF	S.
74	-----	Pontamine fast black LN	S.
75	-----	Pontamine fast blue 6GL	C.
76	-----	Pontamine fast heliotrope BL	S.
77	-----	Pontamine fast orange 2G Conc	C.
78	326	Pontamine fast orange S	S.
79	349	Pontamine fast yellow 4GL	S.
80	593	Pontamine green BX	S.
81	594	Pontamine green GY	S.
82	-----	Pontamine light gray 2G	C.
83	-----	Pontamine light gray BV	C.
84	-----	Pontamine light orange 2G	C-S.
85	382	Pontamine scarlet B	S.
86	-----	Pontamine scarlet 3B	S.
87	-----	Solantine black L	R.
88	-----	Solantine blue FF	R.
89	-----	Solantine blue 2GL	R.
90	-----	Solantine blue 4GL	R.
91	-----	Solantine brown R	R.
92	-----	Solantine orange G	R.
93	353	Solantine pink 4BL	R.
94	-----	Solantine violet R	R.
95	-----	Solantine yellow FF	R.
96	346	Solantine yellow 4GL	R.

C=cotton.

S=silk.

WtdS=weighted silk.

R=rayon.

W=wool.

TABLE 1.—*Dyes which showed no color change in either moisture-free and alkali-free solvent or in solvent containing 0.01 per cent caustic soda and 0.1 per cent water—Continued*

ACID COLORS

Serial No.	Colour Index No.	Name of dye tested	Fiber on which dyed
97	246	Acid blue-black Ex Conc.....	W.
98	699	Acid fast violet BG.....	W.
99	30	Acid fuchsine D.....	W.
100	666	Acid green L Ex.....	W.
101	57	Acid phloxine 6BX Conc.....	W.
102	29	Acid phloxine G.....	W.
103	-----	Acid red OTH.....	W.
104	90	Acid violet 6R.....	W.
105	1054	Alizarine sapphire.....	W.
106	1054	Alizarine sapphire BN.....	W.
107	1054	Alizarine sapphire FS.....	W.
108	1053	Alizarine sapphire SE.....	W.
109	135	Alkali fast green 2G.....	W.
110	714	Alphazurine A.....	W.
111	671	Alphazurine FG.....	W.
112	712	Alphazurine 2G.....	W.
113	88	Azo bordeaux.....	W.
114	-----	Azo dark green B.....	W.
115	-----	Azo eosine 2B.....	W.
116	-----	Azo fast blue G high Conc.....	W.
117	-----	Azo fast blue B high Conc.....	W.
118	-----	Azo fast blue 2R high Conc.....	W.
119	53	Azo wool violet 4B.....	W.
120	146	Azo yellow A5W.....	W.
121	185	Brilliant scarlet 3R.....	W.
122	-----	Brilliant wool blue B.....	W.
123	-----	Brilliant wool blue N.....	W.
124	-----	Buffalo black AR.....	W.
125	246	Buffalo black NBR.....	W.
126	-----	Buffalo black RB.....	W.
127	-----	Buffalo black 3G.....	W.
128	-----	Buffalo black 8B.....	W.
129	294	Buffalo black 10B.....	W.
130	253	Cloth red 2R.....	W.
131	26	Croceine orange Y Conc.....	W.
132	252	Croceine scarlet MOO.....	W.
133	307	Durol black B.....	W.
134	307	Durol black 2B.....	W.
135	304	Fast acid black N2B.....	W.
136	208	Fast acid blue SR Conc.....	W.
137	209	Fast acid blue SB.....	W.
138	667	Fast acid green B.....	W.
139	53	Fast acid violet RM Ex.....	W.
140	57	Fast crimson 6BL.....	W.
141	-----	Fast crimson R.....	W.
142	289	Fast cyanine GB.....	W.
143	289	Fast cyanine 5R.....	W.
144	119	Fast light scarlet EG.....	W.
145	639	Fast light yellow 3G Ex Conc.....	W.
146	176	Fast red AN.....	W.
147	176	Fast red S Conc.....	W.
148	209	Fast wool blue B.....	W.
149	208	Fast wool blue R.....	W.
150	289	Fast wool cyanone R.....	W.
151	289	Fast wool cyanone 3R.....	W.
152	-----	Fast wool violet 2R.....	W.
153	636	Fast wool yellow 3GL.....	W.
154	1180	Indigotine.....	W.
155	861	Induline B Ext.....	W.
156	79	Lake scarlet R.....	W.
157	-----	Lanafuchsine B.....	W.
158	-----	Light fast wool red BL Conc.....	W.
159	138	Metanil yellow 1955.....	W.
160	308	Naphthylamine black V.....	W.

W = wool

TABLE 1.—Dyes which showed no color change in either moisture-free and alkali-free solvent or in solvent containing 0.01 per cent caustic soda and 0.1 per cent water—Continued

ACID COLORS—Continued

Serial No.	Colour Index No.	Name of dye tested	Fiber on which dyed
161	801	Quinoline yellow.....	W.
162	234	Resorcine brown R.....	W.
163	235	Resorcine brown RN.....	W.
164		Wool black B.....	W.
165		Wool black GRF.....	W.
166		Wool blue CG.....	W.
167		Wool green B.....	W.
168	737	Wool green S.....	W.
169		Wool navy B.....	W.
170	151	Wool orange A. Conc.....	W.
171	27	Wool orange 2G cryst.....	W.
172	184	Wool red 40F.....	W.
173	280	Wool scarlet BR.....	W.
174		Wool violet B.....	W.
175	698	Wool violet 4BN.....	W.
176	640	Wool yellow Ex Conc.....	W.

MORDANT AND ACID-MORDANT COLORS

177		Acid alizarine blue B.....	W.
178		Alizarine black powder.....	W.
179	1085	Alizarine blue-black 3B.....	W.
180	1035	Alizarine brown OR.....	W.
181		Alizarine brown 5R Ext.....	W.
182	1078	Alizarine cyanine green CG Ext.....	W.
183		Antbracene chrome brown 2BL.....	W.
184		Antbracene chrome brown RL.....	W.
185	1085	Anthraquinone blue black B.....	W.
186	180	Azo chrome blue B (chromed dyed).....	W.
187	180	Azo chrome blue B (dyed acid).....	W.
188	179	Azo rubine R (chrome dyed).....	W.
189	179	Azo rubine R (dyed acid).....	W.
190	179	Azo rubine Ex (dyed acid).....	W.
191		Chromate brown R.....	W.
192	299	Chrome black F.....	W.
193	40	Chrome orange GG.....	W.
194	431	Chrome red A4B.....	W.
195	262	Clotb red B.....	W.
196		Clotb red R.....	W.
197		Fast chrome brown EB.....	W.
198	56	Fast fuchsine 6B.....	W.
199	29	Fast fuchsine G.....	W.
200		Fast fuchsine GR.....	W.
201		Hastings fast milling scarlet.....	W.

SULPHUR COLORS

202		Sulfogene dark brown GN Ex.....	C.
203		Sulfogene dark brown (a-t).....	C.
204	948	Sulfogene yellow GA.....	C.
205	955	Sulfogene yellow CG.....	C.
206	955	Sulfogene yellow CG (a-t).....	C.

W = wool.

C = cotton.

TABLE 1.—Dyes which showed no color change in either moisture-free and alkali-free solvent or in solvent containing 0.01 per cent caustic soda and 0.1 per cent water—Continued

VAT COLORS

Serial No.	Colour Index No.	Name of dye tested	Fiber on which dyed
207	1102	Anthrene black B (double paste).....	C.
208	1115	Anthrene blue GC (paste).....	C.
209	1113	Anthrene blue GC (double paste).....	C.
210	1114	Anthrene blue BCS (paste).....	C.
211	-----	Anthrene blue RCX (paste).....	C.
212	1106	Anthrene blue RS.....	C.
213	1109	Anthrene blue 3G.....	C.
214	1120	Anthrene brown BB.....	C.
215	-----	Anthrene brilliant blue R (paste).....	C.
216	1099	Anthrene dark blue BO (paste).....	C.
217	-----	Anthrene flavone GC (double paste).....	C.
218	1096	Anthrene golden orange G (paste).....	C.
219	-----	Anthrene golden orange RRT.....	C.
220	-----	Anthrene golden orange 4R.....	C.
221	1102	Anthrene green B (double paste).....	C.
222	1101	Anthrene jade green.....	C.
223	1162	Anthrene red BN.....	C.
224	1161	Anthrene red violet RRN.....	C.
225	1163	Anthrene violet BNX (paste).....	C.
226	1163	Anthrene violet RN (paste).....	C.
227	1104	Anthrene violet 2R (paste).....	C.
228	1118	Anthrene yellow G (paste).....	C.
229	1102	Ponsol black B Conc (powder).....	C.
230	1114	Ponsol blue BCS (powder).....	C.
231	1113	Ponsol blue GD (double paste).....	C.
232	1109	Ponsol blue 3G (paste).....	C.
233	1106	Ponsol blue RS (paste).....	C.
234	1106	Ponsol brilliant blue R (paste).....	C.
235	1101	Ponsol brilliant green G.....	C.
236	-----	Ponsol brown AR (double paste).....	C.
237	1099	Ponsol dark blue BR.....	C.
238	1096	Ponsol golden orange G (double paste).....	C.
239	1097	Ponsol golden orange RRT (paste).....	C.
240	-----	Ponsol golden orange 4R (paste).....	C.
241	1102	Ponsol green BN (paste).....	C.
242	-----	Ponsol pink B (double paste).....	C.
243	1162	Ponsol red BN (double paste).....	C.
244	1161	Ponsol red violet RRNX (paste).....	C.
245	1104	Ponsol violet RR (double powder).....	C.
246	-----	Ponsol yellow AR (double paste).....	C.
247	1118	Ponsol yellow G (double paste).....	C.
248	971	Sulfanthrene blue G (paste).....	C.
249	971	Sulfanthrene blue GR (paste).....	C.
250	-----	Sulfanthrene orange R (paste).....	C.
251	-----	Sulfanthrene pink BG (paste).....	C.
252	-----	Sulfanthrene pink FF.....	C.
253	-----	Sulfanthrene red 3B.....	C.
254	-----	Sulfanthrene scarlet 2B.....	C.
255	1222	Sulfanthrene violet B (double paste).....	C.
256	-----	Thianthrene brilliant red 3B (paste).....	C.
257	-----	Thianthrene orange R (paste).....	C.
258	-----	Thianthrene pink FB (paste).....	C.
259	-----	Thianthrene pink FF (paste).....	C.

DEVELOPED COLORS

260	401	Diazo black BHSW.....	C.
261	401	Diazo black BHSW (DevTN).....	C.
262	317	Diazo blue BR.....	C-S.
263	-----	Diazo blue 3G.....	C-S.
264	317	Diazo blue 2RL.....	C-S.
265	812	Primuline Ex Conc.....	C-R.
266	324A	Diazo scarlet A.....	C.
267	324A	Diazo scarlet R.....	C.

C=cotton.

S=silk.

R=rayon.

TABLE 1.—Dyes which showed no color change in either moisture-free and alkali-free solvent or in solvent containing 0.01 per cent caustic soda and 0.1 per cent water—Continued

ICE COLORS

Serial No.	Colour Index No.	Name of dye tested	Fiber on which dyed
268	69	Naphthanil AS red G base.....	C.
269	69	Naphthanil BS red G base.....	C.

C=Cotton.

In Table 2 are recorded those dyes which showed a slight color change only.

Columns 1, 2, and 3 are the same as in Table 1.

Columns 4 and 5 show the results obtained from the tests. A dash under a fiber heading denotes that that particular fiber was not dyed and consequently could not be tested.

TABLE 2.—Dyes which showed only a slight color change

DIRECT COLORS

Serial No.	Colour Index No.	Name of dye tested	Color change when treated with moisture-free and alkali-free solvent				Color change when treated with solvent containing 0.01 per cent caustic soda and 0.1 per cent water			
			C	S	WtdS	R	C	S	WtdS	R
270	415	Direct orange R.....	N	—	N	N	N	—	N	S
271	682	Direct yellow G.....	N	N	—	—	N	—	S	—
272	—	Erie catechine 3G.....	—	—	—	N	—	—	—	—
273	—	Erie catechine G Conc.....	—	—	—	N	—	—	—	S
274	487	Erie orange Y.....	—	—	—	N	—	—	—	S

SULPHUR COLORS

275	—	Sulfogene brilliant blue 2G Conc.....	N	—	—	S	—	—	—	—
276	—	Sulfogene brilliant blue 6BS.....	N	—	—	S	—	—	—	—
277	1006	Sulfogene brilliant green 2G.....	S	—	—	S	—	—	—	—
278	—	Sulfogene direct blue BRS.....	N	—	—	S	—	—	—	—
279	—	Sulfogene fast green B.....	N	—	—	S	—	—	—	—
280	—	Sulfogene fast green B (a-t).....	S	—	—	S	—	—	—	—
281	940	Sulfogene golden brown G.....	N	—	—	S	—	—	—	—
282	940	Sulfogene golden brown G (a-t).....	S	—	—	S	—	—	—	—
283	940	Sulfogene golden brown R.....	S	—	—	S	—	—	—	—
284	940	Sulfogene golden brown R (a-t).....	S	—	—	S	—	—	—	—
285	—	Sulfogene indigo blue G Conc.....	N	—	—	S	—	—	—	—
286	—	Sulfogene navy blue GL Conc.....	N	—	—	S	—	—	—	—
287	—	Sulfogene navy blue RL Conc.....	N	—	—	S	—	—	—	—
288	—	Sulfogene ochre G.....	S	—	—	S	—	—	—	—
289	—	Sulfogene ochre G (a-t).....	S	—	—	S	—	—	—	—
290	—	Sulfogene olive drab Y.....	S	—	—	S	—	—	—	—
291	948	Sulfogene yellow GA (a-t).....	N	—	—	S	—	—	—	—

VAT COLORS

292	1133	Ponsol red AFF.....	N	—	—	S	—	—	—	—
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N=no color change.

S=slight color change.

TABLE 2.—Dyes which showed only a slight color change—Continued

Serial No.	Colour Index No.	Name of dye tested	Color change when treated with moisture-free and alkali-free solvent				Color change when treated with solvent containing 0.01 per cent caustic soda and 0.1 per cent water			
			C	S	WtdS	R	C	S	WtdS	R
293	401	Diazo black BH Ex Conc.....	N	N	—	N	N	—	—	N
294		Diazo bordeaux 7B.....	N	N	—	—	S	N	—	—
295		Diazo brown R.....	N	N	—	—	S	N	—	—
296	-----	Diazo green 2GL.....	N	N	—	—	S	N	—	—
297		Diazo orange.....	N	N	—	—	S	N	—	—
298		Diazo orange G.....	N	N	—	—	S	N	—	—
299		Diazo red 5BL.....	N	N	—	—	S	N	—	—
300		Diazo red 7BL.....	N	N	—	—	S	N	—	—

ICE COLORS

301	499	Naphthanil AS blue B base.....	N	—	—	—	S	—	—	—
302	82	Naphthanil AS garnet B base.....	N	—	—	—	S	—	—	—
303	82	Naphthanil BS garnet.....	N	—	—	—	S	—	—	—
304	38	Naphthanil AS orange R base.....	N	—	—	—	S	—	—	—
305	118	Naphthanil AS scarlet R base.....	N	—	—	—	S	—	—	—
306	118	Naphthanil BS scarlet.....	N	—	—	—	S	—	—	—

N=no color change.

S=slight color change.

In Table 3 are listed those dyes which showed a decided color change. The letter "D" denotes a decided color change.

TABLE 3.—Dyes which showed a decided color change

DIRECT COLORS

Serial No.	Colour Index No.	Name of dye tested	Color change when treated with moisture-free and alkali-free solvent					Color change when treated with solvent containing 0.01 per cent caustic soda and 0.1 per cent water				
			C	W	S	WtdS	R	C	W	S	WtdS	R
307	-----	Amanil chrome brown GR.....	N	—	—	—	—	D	—	—	—	—
308	-----	Amanil chrome brown 2R.....	D	—	D	—	—	D	—	D	—	—
309	653	Amanil fast orange GLZ.....	N	—	N	—	—	D	—	D	—	—
310	-----	Amanil olive brown RL.....	N	—	N	—	—	D	—	D	—	—
311	502	Benzo axurine G Ex.....	N	—	—	N	N	S	—	—	N	D
312	596	Direct brown CR.....	S	—	—	N	N	D	—	N	N	S
313	608	Direct brown RG.....	D	—	—	N	N	D	—	N	N	D
314	598	Direct brown XR.....	D	—	—	N	N	D	—	N	N	D
315	-----	Direct fast black LR.....	N	—	—	N	N	N	—	N	N	D
316	561	Direct fast brown BT.....	D	—	—	N	N	D	—	—	N	D
317	-----	Direct fast orange RS.....	D	—	N	—	N	D	—	N	N	D
318	126	Direct fast pink E2GN.....	N	—	N	—	D	N	—	N	—	D
319	375	Direct garnet R.....	D	—	—	N	N	D	—	—	N	D
320	593	Direct green B.....	N	—	N	—	N	N	—	N	N	D
321	-----	Direct green 2GB Ex.....	D	—	N	—	N	D	—	N	—	S
322	589	Direct green 2Y.....	N	—	—	N	S	N	—	—	N	N
323	621	Direct orange 2R.....	N	—	N	—	N	D	—	D	—	N
324	621	Direct orange 2RG.....	D	—	N	—	N	D	—	D	—	N
325	225	Direct pink 2B.....	D	—	N	—	N	D	—	N	—	D

D=decided color changes.

N=no color change.

S=slight color change.

TABLE 3.—Dyes which showed a decided color change—Continued

DIRECT COLORS—Continued

Serial No.	Colour Index No.	Name of dye tested	Color change when treated with moisture-free and alkali-free solvent					Color change when treated with solvent containing 0.01 per cent caustic soda and 0.1 per cent water				
			C	W	S	WtdS	R ^a	C	W	S	WtdS	R
326	596	Erie brown 3GN	—	—	—	—	N	—	—	—	—	D
326A	—	Erie catechine B	—	—	—	—	N	—	—	—	—	D
327	598	Erie fast brown GR	—	—	—	—	N	—	—	—	—	D
328	375	Erie garnet RB	—	—	—	—	N	—	—	—	—	D
329	593	Erie green MT	—	—	—	—	N	—	—	—	—	D
330	583	Erie green WT	—	—	—	—	N	—	—	—	—	D
331	—	Light fast brown R	D	—	—	—	N	D	—	N	—	D
332	—	Light fast brown 3YL	S	—	N	—	N	D	—	D	—	D
333	423	Light fast yellow 4GL	S	—	—	N	N	D	—	—	N	S
334	502	Niagara blue G Conc	—	—	—	—	N	—	—	—	—	D
335	—	Niagara blue NR	—	—	—	—	N	—	—	—	—	D
336	515	Niagara blue R	—	—	—	—	N	—	—	—	—	D
336A	—	Solantine red 8BLN	—	—	—	—	N	—	—	—	—	D

BASIC COLORS

337	655	Auramine O	N	—	—	—	—	D	—	—	—	—
338	332	Basic brown BR	D	—	—	—	—	D	—	—	—	—
339	21	Chrysoidine R	D	—	—	—	—	D	—	—	—	—
340	681	Crystal violet	N	—	N	—	—	D	—	D	—	—
341	680	Methyl violet NE	D	—	—	—	—	D	—	—	—	—
342	778	Phloxine B	—	N	N	—	—	—	N	D	—	—
343	749	Rhodamine B Ex	D	N	N	N	—	D	N	D	N	—
344	779	Rose bengal	—	N	N	—	—	—	D	D	—	—
345	841	Safranin T Ex	N	—	N	—	—	D	—	D	—	—
346	815	Thioflavine, T G Ex	—	N	N	N	—	D	—	N	D	D
347	729	Victorial blue BX	D	N	N	—	—	D	S	D	—	—
348	657	Victorial green	N	—	D	—	—	D	—	D	—	—

SULPHUR COLORS

349	1012	Sulfogene bordeaux BR	D	—	—	—	—	D	—	—	—	—
350	1012	Sulfogene bordeaux BR (a-t)	D	—	—	—	—	D	—	—	—	—
351	1012	Sulfogene bordeaux 5B	D	—	—	—	—	D	—	—	—	—
352	1012	Sulfogene bordeaux 5B (a-t)	D	—	—	—	—	D	—	—	—	—
353	—	Sulfogene brilliant green 4GX	S	—	—	—	—	D	—	—	—	—
354	988	Sulfogene carbon 2B Conc	N	—	—	—	—	D	—	—	—	—
355	978	Sulfogene carbon 8G Conc	N	—	—	—	—	D	—	—	—	—
356	—	Sulfogene carbon HXX	N	—	—	—	—	D	—	—	—	—
357	978	Sulfogene carbon M Conc	S	—	—	—	—	D	—	—	—	—
358	978	Sulfogene carbon supra	S	—	—	—	—	D	—	—	—	—
359	978	Sulfogene carbon R supra	S	—	—	—	—	D	—	—	—	—
360	—	Sulfogene cutch M Conc	S	—	—	—	—	D	—	—	—	—
361	—	Sulfogene cutch M Conc (a-t)	S	—	—	—	—	D	—	—	—	—
362	—	Sulfogene cutch O	S	—	—	—	—	D	—	—	—	—
363	—	Sulfogene cutch O (a-t)	S	—	—	—	—	D	—	—	—	—
364	1006	Sulfogene green 2B	N	—	—	—	—	D	—	—	—	—
365	1006	Sulfogene green 2B (a-t)	N	—	—	—	—	D	—	—	—	—
366	1006	Sulfogene green M Conc	N	—	—	—	—	D	—	—	—	—
367	—	Sulfogene olive G	N	—	—	—	—	D	—	—	—	—
368	—	Sulfogene olive G (a-t)	N	—	—	—	—	D	—	—	—	—
369	—	Sulfogene olive GN	N	—	—	—	—	D	—	—	—	—
370	—	Sulfogene olive GN (a-t)	N	—	—	—	—	D	—	—	—	—
371	—	Sulfogene olive drab Y (a-t)	S	—	—	—	—	D	—	—	—	—

D=decided color change.

N=no color change.

S=slight color change.

TABLE 3.—Dyes which showed a decided color change—Continued

DEVELOPED COLORS

Serial No.	Colour Index No.	Name of dye tested	Color change when treated with moisture-free and alkaline solvent					Color change when treated with solvent containing 0.01 per cent caustic soda and 0.01 per cent water				
			C	W	S	WtdS	R	C	W	S	Wtds	R
372	552	Diazo black RS.....	N	—	N	—	N	N	—	N	—	D
373	—	Diazo brown 2G.....	N	—	N	—	N	D	—	N	—	D
374	—	Fast black V.....	N	—	N	—	N	S	—	S	—	—
375	—	Diazo orange 2R.....	N	—	N	—	—	S	—	D	—	—
376	—	Diazo scarlet 2BL.....	N	—	N	—	—	S	—	D	—	—
377	—	Diazo violet BL.....	N	—	N	—	—	N	—	D	—	—
378	654	Diazo yellow 2GL.....	N	—	N	—	—	N	—	N	—	—

ICE COLORS

379	499	Naphthanil BS-blue B base.....	N	—	—	—	—	D	—	—	—	—
380	38	Naphthanil orange R base.....	N	—	—	—	—	D	—	—	—	—
381	68	Naphthanil AS-scarlet G base.....	N	—	—	—	—	D	—	—	—	—
382	68	Naphthanil BS-scarlet.....	N	—	—	—	—	D	—	—	—	—

D=decided color change.

N=no color change.

S=slight color changes

VI. DISCUSSION OF RESULTS

The above results show that about 75 per cent of dyes of the direct class were unaffected by dry-cleaning solvents. No change was noted on dyeings made on weighted silks. Ninety per cent of the dyeings on silk, 72 per cent of the dyeings on rayon, 70 per cent of the dyeings on cotton showed no color change.

Dyeings on wool with acid, mordant, and acid-mordant colors were unaffected.

The basic colors offered poor resistance to dry cleaning. Samples Nos. 342, 343, and 346 on wool, and No. 343 on weighted silk, were unaffected. Sample No. 346, dyed on rayon and unweighted silk, was almost completely discharged. The majority of basic colors on cotton and silk stained other fabrics.

Practically all of the sulphur colors suffered an alteration in shade in both of the tests. The samples marked "(a-t)" were aftertreated with copper sulphate, sodium dichromate, and acetic acid. Dyeings made with the vat colors were unchanged. Several of these colors bled in the tests but did not stain white fabrics. This was particularly true of the red, pink, and red-violet colors. The bleeding of these colors is to be expected, since the majority of the dyes of this group are somewhat soluble in the solvent.

The ice and developed colors showed no change in shade in moisture-free solvent, but in the solvent containing alkali about 65 per cent of these dyeings suffered an alteration in shade. The majority of the

ice colors bled considerably in the tests but did not stain white materials.

In addition to the tests made above, other tests were conducted on the following dyed fabrics: Cellulose acetate rayon; weighted silk dyed with Setamine colors; mixed fabrics dyed with union colors; draperies, couch coverings, and cotton, linen, jute casement fabrics; silk velvet; and transparent velvets.

Of the 60 samples of cellulose acetate rayon tested, four samples showed a color change. One of the samples which was dyed a seasonal shade showed a slight color change in the solvent containing alkali. Two samples of printed material showed a decided color change in the solvent containing alkali. The fourth sample, a printed voile, showed a decided color change in both tests.

Weighted silk fabrics dyed with Setamine colors showed no color change in either test.

No change in shade was detected in testing 60 samples of union-dyed fabrics.

Of the 26 samples of draperies, couch coverings, and cotton, linen, and jute casement fabrics, three showed a decided color change in both tests. Two of these were cotton cretonnes and the other a cotton and rayon casement cloth.

A sample of silk velvet dyed with a basic color showed a decided color change in both tests. The color bled and tinted white silk, cotton, and rayon.

Six samples of transparent velvet showed no color change in either test.

Dyeings of acid colors on wool, sulphur colors on cotton, developed and vat colors, and direct colors on rayon were made in two strengths—the one a light shade, the other a dark shade. This was done in order to ascertain whether or not light dyeings behaved differently than deep shades. No difference in results was noted between dyeings made in two strengths.

VII. CONCLUSION

From the results obtained it is apparent that, although basic dyes offer poor resistance to dry cleaning, the majority of dyes which are most likely to be encountered in dry cleaning are unaffected by it. In order to minimize the danger of any change in color during dry cleaning, it is advisable to keep the solvent as free as practicable from moisture and alkali.

WASHINGTON, February 19, 1929.