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EVALUATION OF CREASE-RESISTANT FINISHES FOR FABRICS

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ABSTRACT

Certain flexural characteristics of representative woven fabrics before and after the application of commercial crease-resistant finishes were measured using three different methods, namely, the creasing angle, flexometer, and modified compressometer methods. Specimens of paper, Cellophane, cotton, rayon, worsted, and rubber, which are recognized to vary in resistance to creasing over a great range, were also measured by the three methods and the results used for comparison.

The crease-resistant finishing treatments increased the energy required to deform the cloth specimens, that is, increased the stiffness of the cloths. This increase exceeded 100 percent for some of the cloths. The energy of recovery was also increased by these treatments, the increase ranging from 20 to 100 percent. Neither of these two quantities can be taken individually as a measure of crease resistance. However, the ratio of the latter to the former, here termed "resilience," is related to the resistance to creasing. The resilience of nearly all of the cloths, as determined by each of the three test methods, was increased by the crease-resistant finishing treatments.

The three test methods described can be used to evaluate the improvement given by crease-resistant finishes, using the measurements on the cloths before treatment as the basis of comparison. The methods should be valuable in systematic studies of the effect of different finishing treatments and in determining the effects of relative humidity, temperature, and other factors on the different finishes. Method 1, however, does not give a critical measure of stiffness, a property that is greatly affected by crease-resistant finishes and should be measured. The resilience as determined by these methods is dependent upon the testing conditions, as for example, the magnitude of the maximum load in method 3. It may be found necessary in test methods of this type to vary the maximum load with the thickness or weight of the fabric to be tested.

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I. INTRODUCTION

Most textiles fibers are deficient in natural resilience. Articles made from them tend to become wrinkled and to lose their shape and desired appearance. It has been found possible in recent years to improve the resilience of textiles by chemical processing, and crease-resistant fabrics are now available. The "anticrease" process of Tootal, Broadhurst, Lee, Ltd., which is being applied in the United States as well as in England, was the first to attract attention. In it the fabric is impregnated with a synthetic resin. This development in the industry has led to a need for a quantitative method for evaluating the improvement of the product and of the resilience of fabrics in general. The work reported in this paper was undertaken to determine the flexural characteristics of woven fabrics before and after the application of commercial crease-resistant finishes. The results are compared with the flexural characteristics of a series of samples which have not had crease-resistant treatments, but which are recognized to vary in resistance to creasing over a considerable range.

The flexural characteristics of the samples were measured by three different methods. The results are presented and discussed in this paper.

II. MATERIALS AND TEST METHODS

1. SAMPLES

Representative woven fabrics ranging from light-weight voile to heavy suiting cloth, before and after the application of crease-resistant finishing treatments, were furnished for the work by several manufacturers. These fabrics were made from cotton, rayon, and linen. Specimens of paper, Cellophane, cotton, rayon, worsted, and rubber, having crease resistances varying over a great range, were added to the list of samples for comparison. Specimens of the materials were conditioned by exposure for several days in an atmosphere of 65-percent relative humidity and a temperature of 70° F, and they were tested under these conditions.

2. CREASING-ANGLE METHOD

The specimens tested were 2 inches long and ½ inch wide with the long dimension in the warp or in the filling for tests in these respective directions. Each specimen was folded by bringing the two ends into coincidence, thereby forming a loop at the middle. The two ends were held together with a pair of tweezers and the loop of the specimen was inserted between two parallel plates and placed under a load of 1.00 pound. The load was removed at the end of 3 minutes, and the specimen was picked up with the tweezers and suspended freely at the middle over a horizontal wire of small diameter, approximately 1 mm. At the end of 3 minutes the horizontal distance between the two ends was measured and the angle at the vertex, where the specimen was folded, was calculated. An angular scale, graduated in degrees, placed directly back of the test specimen, is a convenience in reading the angle directly. A device of this kind, developed by Barnard, is shown in figure 1. Eight specimens can be suspended on it at a time. The disk on which the specimens are suspended can be rotated by means of a crank to bring any one of the eight specimens into position for measurement, that is, to align one edge of the specimen with the zero-angle line and the other edge to indicate the magnitude of the creasing angle.

In this test method the ends of the specimens droop an amount which depends not only upon the magnitude of the load and the time it is applied to the fold, but also upon the weight, thickness, and type

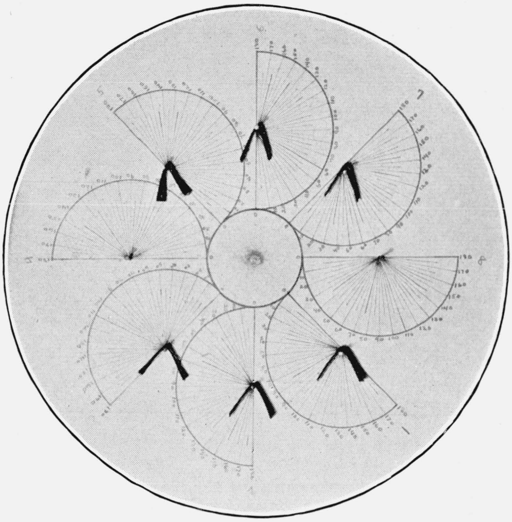

FIGURE 1.—*Multiple protractor for measuring the creasing angle.*

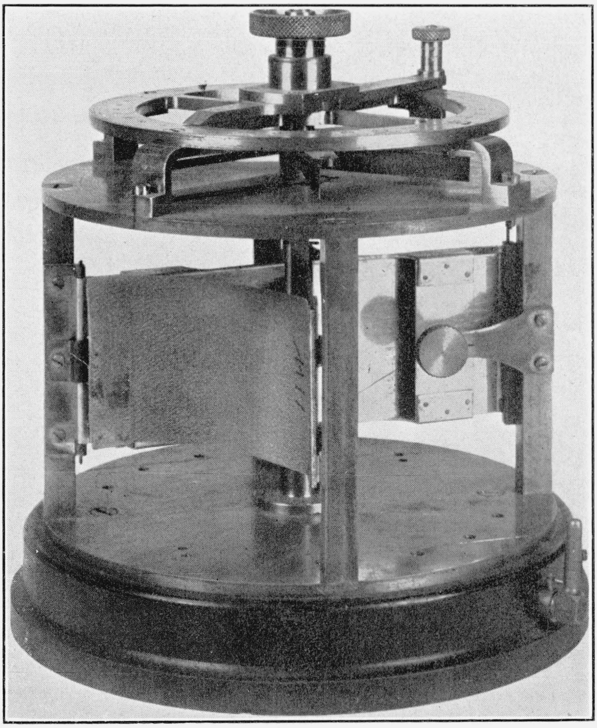

FIGURE 2.—*Flexometer.*

of construction of the cloth. The angular deflections of the ends of the various specimens tested vary over a great range because of these inherent differences between the cloths. For example, the ends of a specimen of a thin sheet of rubber which shows no crease after the application of the load, droop more, even before the load is applied to the specimen, than the ends of a specimen of an easily creased cotton fabric after the application of the load to the fold. To take account of this natural drooping of the ends of each specimen, the angular deflection was determined both before and after the application of the load to the fold. The ratio of the angle at the vertex of a specimen after the load is applied to the fold to the angle before the application of the load is here designated the "resilience ratio."

Various modifications[1] of this method for measuring the effect of crease-resistant treatments have been reported in the literature. In one arrangement the specimen is folded as already described and then compressed by a dead weight for several minutes, after which the specimen is placed on edge, with the fold in a vertical position, on the surface of mercury. The angle of the fold is measured after a specified period. The result by this method is influenced by the condition of the mercury surface. Also, it is not possible to determine the effect of the treatment on the stiffness of the cloth. Since the stiffness is greatly affected by the treatments and should be evaluated, the procedure of floating the creased specimen on mercury was not used in this investigation.

3. FLEXOMETER METHOD

Two specimens, each 4 inches long and 1¾ inches wide with the long dimension in the warp or in the filling for tests in these respective directions, were mounted in opposite angles formed by the two intersecting vertical plates of the flexometer[2] shown in figure 2. One of these plates is cut along the intersecting axis and each half is fastened to the frame of the instrument. The other plate is attached to a spindle and can be rotated freely about the axis of intersection of the two plates. The top of the spindle carries six calibrated cantilever springs mounted radially 60 degrees apart. A hub having six spokes, which can be rotated by means of a knob, is located above the six springs. By placing a pin in a spoke and rotating the hub the spring located directly below the spoke is deflected. The deflection of the spring exerts a torque on the spindle and causes the plate to rotate. The magnitude of this torque is equal to the torque exerted by the pair of test specimens as they resist being folded between the two plates. The magnitude of the applied torque is ascertained from the deflection of the calibrated cantilever spring. Readings were taken at definite angles between the plates, first for decreasing and then for increasing angles, according to the procedure described in Bureau Research Paper RP555. Successive readings were taken as rapidly as possible, the time required for one reading being about 15 seconds. The energy expended in folding the specimens through a given angle is equal to the product of the average torque and the

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[1] C. Amick. *Crease-resisting fabrics*, Am. Dyestuff Reptr. **24**, 554–557, 662–664, 645–648, and 665 (1935).
W. Matthaes. *Lilienfeld rayon: Crease resistance*, Kunstseide **18**, 292–293 (1936).
Society of Dyers and Colourists, **52**, No. 1, 38; **52**, No. 8, 117 (1936).
Crease-resistant textiles without resins, Silk and Rayon, **11** p. 46 (January 1937).
K. Quehl. *Staple fibre fabrics: Crease-resistance*, Melliand Textilberichte **18**, 241–242 (1937).

[2] Herbert F. Schiefer. *The flexometer, an instrument for evaluating the flexural properties of cloth and similar materials*, BS J. Research **10**, 647–657 (1933) RP555.

change in the angle between the two plates. The total energy expended in folding the specimens to a minimum angle between the plates was determined, as well as the energy recovered when the specimens were allowed to unfold. The minimum angle to be employed was calculated from the thickness of the material using the equation $\beta=430\,h$, where β is the angle in degrees and h is the thickness in inches measured with a gage having a circular foot 1 inch in diameter and exerting a pressure of 1 lb/in^2. The ratio of the energy recovered to the energy expended is here termed the "flexural resilience."

The work recovered after keeping the specimens folded at the minimum angle for 5 minutes, and the work done and recovered in refolding and unfolding the specimens after they were allowed to remain unfolded for 5 minutes were also measured. These data did not contribute to the evaluation of crease resistance and accordingly are not reported here. Apparently, 5 minutes was too short a period of time to allow for readjustments in the specimens.

4. COMPRESSOMETER METHOD

A very sensitive modified compressometer, illustrated in figure 3, was designed and used for measuring the flexural properties of lightweight woven fabrics. The instrument has a circular presser foot, 1 inch in diameter, which is fastened to the top of a helical spring through a ball-and-socket connection. The foot may be lowered or raised by means of a rack and pinion, thereby increasing or decreasing the load which the presser foot exerts upon a specimen placed on an anvil beneath it. This load is indicated by the dial indicator which registers the elongation of the calibrated helical spring. The vertical displacement of the rack is indicated on the scale engraved upon the circumference of a disk which is fastened to the axis of the pinion. The vertical displacement of the foot is equal to the displacement of the rack minus the elongation of the spring. The rack and pinion must be uniform, because any irregularities in them produce nonuniform vertical displacements and necessitate either engraving a nonuniform scale on the disk or applying a correction.

The specimens tested were 3 inches long and 2 inches wide, with the long dimension in the warp or in the filling for tests in these respective directions. Two rows of three holes each were punched in each specimen. The holes were spaced 1 inch apart in the long direction and 1½ inches in the short direction. The specimen was mounted through these holes in an accordion fashion consisting of two loops on a special support, as illustrated in figure 3. An aluminum plate weighing 0.02 pound was placed on this specimen. The support and specimen were placed underneath the presser foot of the compressometer. The height, in inches, of the accordion loops was determined first for increasing loads up to 0.60 pound and then for decreasing loads, readings being taken at 0.05, .10, .15, .20, .30, .40, and .60 pound. Successive readings were taken as rapidly as possible, the time required for one reading being about 10 seconds. The energy, in inch-pounds, expended during loading and that recovered during unloading were calculated, using the expression $0.025\ (3a+2b+2c+3d+4e+6f-20g)$, where a, b, c, d, e, f, and g are the heights of the accordion loops at the above loads, respectively. The ratio of the energy re-

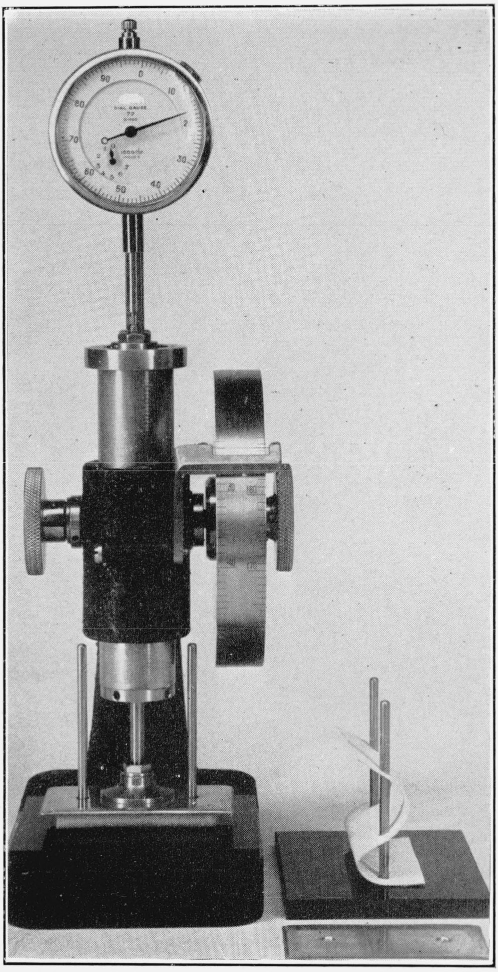

FIGURE 3.—*Modified compressometer.*

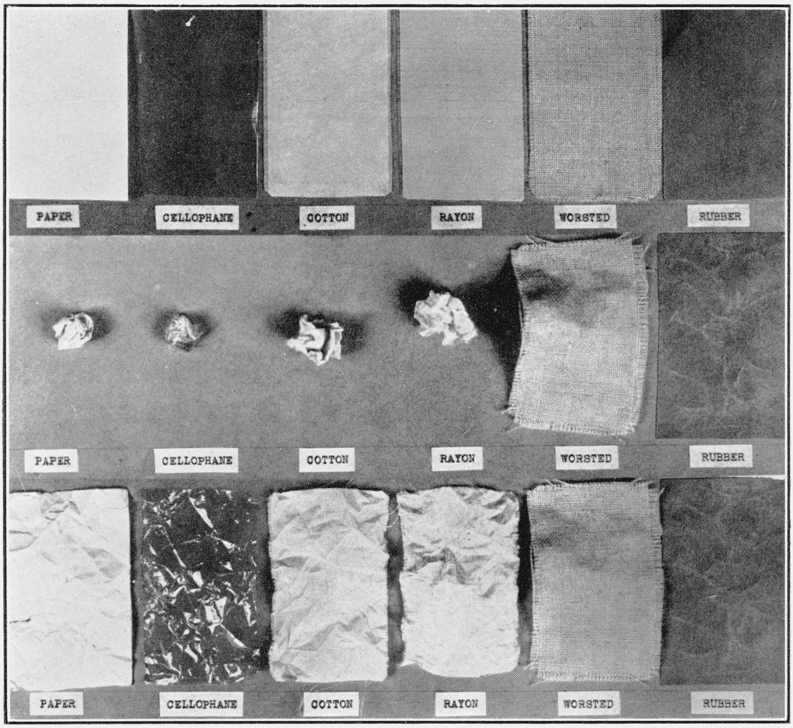

FIGURE 4.—*Specimens having crease resistances varying over a great range.*

Top row. Appearance of specimens before wrinkling.
Middle row. Appearance of specimens after being compressed and crushed into a small ball.
Bottom row. Final appearance of specimens after being straightened out.

covered to the energy expended is here termed the "compressometer flexural resilience."

The data obtained after allowing the specimen to remain compressed for 5 minutes at the maximum load of 0.60 pound and after allowing it to remain uncompressed for 5 minutes did not contribute to the evaluation of crease resistance, agreeing with the flexometer method in this respect. However, the time of application of the load of deformation may be as important as the magnitude of the load. For example, a sample of worsted cloth in which the loops were compressed continuously for 3 months by a load of only 0.02 pound showed more pronounced creases of a more permanent nature, judged by visual appearance, than the creases produced by a load of 0.60 pound acting for only 5 minutes.

A method in which the test specimen is folded in a series of accordion loops and compressed by a dead weight has been used by Sommer.[3] The height of the loops under a small initial load, the height of the loops when compressed by a dead weight, and the final height of the loops after the weight was removed were used in evaluating a fabric. The value obtained decreased nonlinearly with the magnitude of the dead weight used. Specific details regarding this method and the time of application of the dead weight are not given.

III. RESULTS AND DISCUSSION

The results of the tests are given in table 1.

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[3] *Textilprüfung auf neuen Wegen.* Abstract of a paper delivered at a meeting of the German Engineering Society, by Prof. H. Sommer, Director, Fibrous Division, National Institute for Testing Material, Berlin, on September 25, 1936.

TABLE 1.—*Effect of crease-resistant finishing treatments on cloths measured by three methods*

[Specimens 12 to 17, inclusive, are a series having crease resistances varying over a great range. *W* and *F* indicate the warp and filling directions, respectively. The units for work in methods 2 and 3 are different, to conform with those previously used for the flexometer and compressometer]

Specimen	Thickness	Designation	Treatment	Direction	Method 1			Method 2			Method 3		
					Angle		Resilience ratio (3)	Work done (1)	Work recovered (2)	"Flexural resilience" (3)	Work done (1)	Work recovered (2)	"Compressometer flexural resilience" (3)
					Before applying the load (1)	After applying the load (2)							
	Inch				*Degrees*	*Degrees*	*Percent*	*Ergs*	*Ergs*	*Percent*	In.-Lb.	In.-Lb.	*Percent*
1	0.007	Cotton voile	Not treated	*W*	148	39	26	43×10^{2}	18×10^{2}	41	34×10^{-4}	9×10^{-4}	26
			do	*F*	128	45	35	39	19	48	33	10	30
			Treated	*W*	152	71	47	59	28	48	51	16	31
			do	*F*	148	85	57	62	36	57	53	18	34
2	.008	Cotton voile	Not treated	*W*	144	63	44	44	22	50	63	26	42
			do	*F*	137	50	36	48	21	44	70	28	40
			Treated	*W*	134	81	60	64	35	55	100	32	32
			do	*F*	129	70	60	58	35	60	91	34	37
3	.009	Cotton-warp and rayon-filling dress fabric	Not treated	*W*	137	46	34	74	39	53	111	36	32
			do	*F*	144	55	38	80	47	59	119	32	27
			Treated	*W*	137	70	51	109	65	60	131	48	37
			do	*F*	128	74	58	109	76	70	138	45	33
4	.012	Spun-rayon dress fabric	Not treated	*W*	121	60	50	82	52	64	129	38	30
			do	*F*	103	46	45	63	38	60	114	34	30
			Treated	*W*	180	123	68	187	103	55	197	70	35
			do	*F*	110	65	59	76	53	70	119	52	44
5	.015	Spun-rayon dress fabric	Not treated	*W*	134	57	43	94	55	58	189	41	22
			do	*F*	108	63	58	67	41	61	144	44	31
			Treated	*W*	152	87	57	240	122	51	245	84	35
			do	*F*	128	81	63	109	72	66	159	73	46
6	.026	Cotton plaid	Not treated	*W*	157	59	38	106	47	44	178	41	23
			do	*F*	152	55	36	125	52	41	144	43	30
			Treated	*W*	180	80	44	193	88	45	218	60	28
			do	*F*	180	79	44	178	79	44	176	55	31

7	.005	Rayon dress fabric	Not treated	*W*	180	61	34	181	68	38	142	29	20
			do	*F*	140	45	32	85	35	41	96	28	29
			Treated	*W*	164	106	65	171	104	61	197	67	34
			do	*F*	130	75	58	111	75	67	130	39	30
8	.016	Rayon suiting	Not treated	*W*	137	72	53	125	74	60	190	57	30
			do	*F*	140	72	51	179	100	56	210	70	33
			Treated	*W*	148	79	53	154	93	60	202	72	36
			do	*F*	148	84	57	241	138	57	234	85	40
9	.013	Rayon jacquard	Not treated	*W*	180	87	48	203	113	55	279	49	18
			do	*F*	128	93	73	69	46	66	134	56	42
			Treated	*W*	180	131	73	454	203	66	386	179	46
			do	*F*	180	128	71	174	69	55	215	69	32
10	.020	Spun-rayon suiting	Not treated	*W*	162	54	34	168	80	48	304	50	16
			do	*F*	144	49	33	225	107	48	321	79	25
			Treated	*W*	144	80	56	315	156	49	278	109	39
			do	*F*	162	92	57	408	203	50	398	136	34
11	.019	Linen suiting	Not treated	*W*	180	55	30	511	164	32	399	79	20
			do	*F*	180	47	33	414	122	29	325	64	20
			Treated	*W*	157	60	55	413	251	61	371	141	38
			do	*F*	152	59	47	231	144	62	268	105	39
12	.003	Bond typewriting paper	Not treated	*A*	180	19	11	1360	273	20	567	137	24
			do	*B*	180	26	15	800	179	22	513	113	22
13	.002	Cellophane	Not treated	*A*	180	26	14	274	84	31	265	36	14
			do	*B*	180	29	16	211	95	45	262	25	11
14	.005	Cotton lining	Not treated	*W*	180	65	36	302	108	34	255	33	13
			do	*F*	180	57	32	259	91	25	214	29	14
15	.004	Rayon lining	Not treated	*W*	180	78	43	96	47	49	189	28	15
			do	*F*	180	81	45	74	42	57	111	26	23
16	.018	Worsted necktie lining	Not treated	*W*	180	123	68	286	221	77	323	208	64
			do	*F*	180	140	78	287	244	85	322	230	71
17	.012	Sheet-rubber dental dam	Not treated	--------	61	55	90	78	61	79	138	125	91

Specimens 1 to 11, inclusive, are a representative group of cotton, rayon, and linen cloths ranging from light to heavy weight. Measurements were made on these cloths before and after crease-resistant finishing treatments. The results on these cloths indicate the effect of the crease-resistant treatment. Specimens 12 to 17 included paper, Cellophane, cotton, rayon, worsted, and rubber, which have not had crease-resistant treatments but which have crease resistances varying over a great range, as can be judged from the appearance of these specimens in figure 4. They also vary in stiffness over a great range. The measurements on them serve as a criterion of the relative crease resistance of the cloths before and after treatment. The data in table 1 serve as a basis in comparing the three test methods used.

The values reported for each test method in the columns numbered (1) are related to the stiffness of the cloths; those in columns numbered (2) are related to the energy of recovery; and those in columns numbered (3) are related to the resilience.

The data in table 1 are plotted in figure 5 to show the over-all effect of the crease-resistant treatments and for a comparison of the three test methods. The results for method 1 are plotted in the first column; those for method 2 are plotted in the second column; and those for method 3 are plotted in the last column. The values reported in the columns numbered (1) in table 1 are plotted in the top row of figure 5; those in columns numbered (2) are plotted in the second row; and those in columns numbered (3) are plotted in the bottom row. The values for the treated specimens are plotted as abscissas and those for the specimens before treatment are plotted as ordinates. The 45-degree diagonal is drawn in each plot to indicate whether or not the treatment increased or decreased the quantity plotted, a point falling below or above the diagonal indicating an increase or a decrease, respectively. A point which falls on the diagonal indicates that the treatment had no effect on the quantity plotted. The data for specimens 12 to 17, which have not had crease-resistant treatments, are plotted on the 45-degree diagonal for ease of comparison with the results for the specimens before and after the crease-resistant treatment.

With only a few exceptions, the treatments increased the energy required to deform the cloth specimens, that is, increased the stiffness of the cloths. This increase exceeded 100 percent for some of the cloths. Specimen 11, a linen fabric, is an exception.

Since the stiffness of the cloth is greatly affected by the crease-resistant treatments, the evaluation of this characteristic may be very important, at least for some of the uses for which these cloths may be intended. Method 1 does not give a critical measure of stiffness. Many of the specimens which are known to vary greatly in stiffness, in particular specimens 12 to 16, inclusive, are not differentiated by this method. This is a disadvantage of the method.

The energy of recovery of each fabric, including the linen specimen 11, was increased by the crease-resistant treatments. The increase ranged between 20 and 100 percent. The percentage increase in the energy of recovery of the treated to the untreated specimens of the same cloth is no doubt a measure of the improvement resulting from the treatment. The magnitude of the angle after creasing, method 1, which has been used as a criterion of the resistance to creasing, is not necessarily a measure of crease resistance. According to such a criterion, specimen 17, which is a thin sheet of rubber and has practically no tendency to assume a permanent crease under a load, would be considered very poor compared to many of the other specimens which actually show a marked crease after the application of a load. For the same reason, the magnitude of the energy recovered in method 2 or 3 cannot be taken as a criterion of the resistance to creasing of woven fabrics.

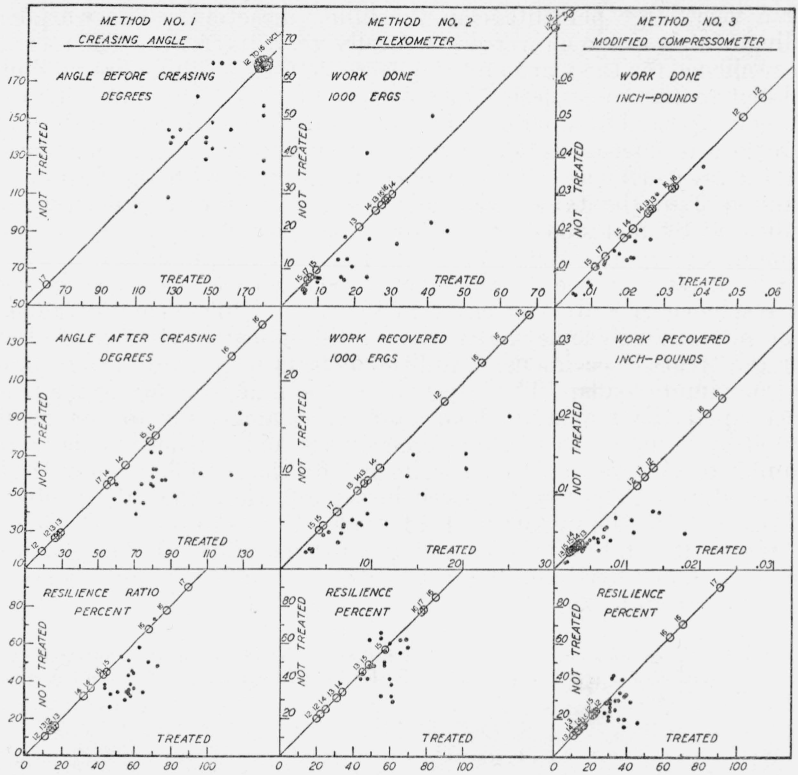

FIGURE 5.—*Effect of crease-resistant treatments on cloths as measured by three test methods.*

Solid points indicate specimens 1 to 11 before and after treatment. Open circles, specimens 12 to 17, are plotted on the 45-degree diagonal for ease of comparison and indicate the fabrics having crease resistances varying over a great range without a treatment.

The ratio of the energy of recovery to that expended, designated "resilience," is related to the resistance to creasing. For example, specimens 12, 13, and 14, having low crease resistances, were found to have low values of resilience, whereas specimens 16 and 17, having high crease resistances, were found to possess high values of resilience. Using the resilience of these specimens as a criterion, the specimens 1 to 11 as a group, are superior to specimens 12, 13, and 14, but inferior to 16 and 17. Although the resilience of nearly all of the fabrics, as determined by each of the three test methods, was increased by the crease-resistant finishing treatments, as a group these fabrics are inferior to fabrics made from fibers having high natural resilience. These conclusions were also borne out by visual observation of the appearance of these specimens after the various tests. The general improvement in resilience imparted by the crease-resistant finishing treatments is well established, however, and still greater improvement may be expected to result from more extensive researches.

A closer examination of the results for resilience given in table 1 indicates that the finishing treatments did not increase the resilience of all fabrics. The value for specimen 9 tested in the filling direction is a notable exception. The stiffness of this specimen was increased by a very large percentage in the filling direction. The warp and filling of this specimen were structurally very different. The increase in resilience for the warp and the decrease for the filling are no doubt related to the construction of this specimen and this behavior may also be expected in other specimens. In fact, the stiffness in the warp direction of specimens 4 and 5 was increased by a large percentage by the treatment and the resilience determined with the flexometer, method 2 in the table, was decreased. The increase in resilience indicated by methods 1 and 3 for these specimens justified a closer examination of the methods, specimens, and results obtained.

Check tests by the flexometer method indicated that the decrease in resilience is real. Check tests by the modified compressometer method, although somewhat variable, still indicated a higher resilience for the treated specimens. Additional tests were made using different maximum loads. These tests indicated a dependence of the resilience upon the maximum load, somewhat analogous to the results found by Sommer, to which reference was made earlier in this paper. Similar tests were made for specimen 2 by the modified compressometer method. The results, given in table 2, show that the resilience increased with the maximum load used. Furthermore, the resilience of the treated fabric was slightly greater than that of the untreated fabric at a low maximum load, whereas at a high maximum load the reverse was indicated.

TABLE 2.—*Effect of maximum load used in the modified compressometer method on the flexural characteristics of cotton voile before and after treatment with a crease-resistant finish.*

Maximum load	Specimen	Work done	Work recovered	Resilience
lb		in.-lb	in.-lb	*Percent*
0.30	Not treated	32×10^{-4}	5×10^{-4}	16
	Treated	46	8	17
.40	Not treated	41	8	20
	Treated	66	15	23
.50	Not treated	47	14	30
	Treated	80	18	23
.60	Not treated	63	26	42
	Treated	100	32	32

These results show that the reversal in resilience between methods 2 and 3 may be attributed to the difference in their testing conditions. In methods 1 and 3 the specimens are compressed by a constant maximum load, regardless of the weight or thickness of the specimens. In method 2, however, the specimens are folded to a minimum angle of such magnitude that equal stresses are produced in the extreme fibers of homogeneous isotropic specimens. Although fabrics cannot be considered as homogeneous isotropic specimens, the testing procedure in method 2 of folding the specimens to a minimum angle, which is determined from the thickness of the specimen, is more rational than applying a constant maximum load to all the specimens as in methods 1 and 3. For in deforming a specimen by a series of increasing loads, as in method 3, the total work expended on the specimen is equal to the summation of the products of the applied load and the distance through which the load acts. Thus, in testing two specimens which differ greatly in stiffness by applying the same maximum load, the deformation depends upon the stiffness, and the ratio of the energies expended or recovered is not necessarily the same as the ratio of the energies expended or recovered when these two specimens are deformed to the same degree, as in method 2, by applying a variable maximum torque proportional to the stiffness. Unfortunately, specimens 2, 4, and 5 were considerably wrinkled during shipment. Great care was exercised in sampling, but variations, which could not be detected by visual inspection, may have existed between the samples selected for test. Therefore, the variations in resilience by methods 2 and 3 for the specimens 2, 4, and 5 cannot be attributed definitely to the difference in the condition of test between methods 2 and 3.

The three test methods described can be used to evaluate the improvement given by crease-resistant finishes, using the measurements on the cloths before treatment as the basis of comparison. They should be valuable in systematic studies of the effect of different finishing treatments and in determining the effects of relative humidity, temperature, and other factors on the different finishes. Method 1, however, does not give a critical measure of stiffness, a property that is greatly affected by crease-resistant finishes and should be measured. The resistance to creasing of fabrics in general is related to the resilience. The resilience as determined by these methods is dependent upon the testing conditions, as for example the magnitude of the maximum load in method 3. It may be found necessary in test methods of this type to vary the maximum load with the thickness or weight of the fabric to be tested.

The user of fabrics, however, who probably judges crease resistance primarily by the changes in the appearance of the fabrics, is not concerned so much with the effects of finishing treatments on a particular fabric as with the resistance to creasing of different fabrics regardless of the treatment they may have received in the course of manufacture. Although the test methods described in this paper indicate whether or not an improvement in crease resistance results from a finishing treatment, they may not clearly indicate the relative merits of the fabrics of different compositions and constructions from the viewpoint of the user. For this there appears to be needed first a standard procedure for subjecting fabrics to creasing forces in a manner and under conditions that can be correlated with normal use of the fabrics, and second, a method for evaluating the changes in appearance the fabrics undergo in this treatment. Work on the development of an optical method of test for this purpose is being undertaken in the Textile Section of the National Bureau of Standards.

The author acknowledges his indebtedness to Mr. Kenneth Barnard of the Pacific Mills and chairman of the Committee on test methods for crease resistance and permanent finishes, of the American Association of Textile Chemists and Colorists, and to Dr. D. H. Powers, who is also a member of the committee, for suggestions and interest in this work. Grateful acknowledgment is also made to Röhm & Haas Co., Pacific Mills, and Tootal, Broadhurst, and Lee, Limited, for furnishing material for testing.

WASHINGTON, December 4, 1937.

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