Carefully made tests to ascertain the usefulness of this composition in the treatment of raw silk, demonstrate that it possesses the property of softening the natural gum or "sericin" on the silk fibres, thereby loosening the fibres, but without any appreciable solvent action on the sericin itself.

When the silk is immersed in an emulsion made with this "composition" in a suitable proportion, the action is not at once noticeable, but after a period of two or more hours, a softening is apparent, and upon a further immersion of six to ten hours, the action is practically complete. The "sericin" has been effectively softened, and the fibres are free. The oil contained in the "composition," instead of being deposited *on* the fibres, is completely absorbed, and this property adds a certain amount of weight to the silk, which will probably offset the usual small amount of waste that always is present in the operation of throwing.

The proportion of this "composition" that may be necessary for satisfactory work on average qualities of raw silk, according to experiments, is about two per cent (2%) of the weight of the silk to be treated. That is, two pounds of the "composition" for each one hundred pounds of skein silk. This proportion may be varied, depending upon the nature and quality of the silk to be treated, from as low as 1½ pounds to 2½ pounds. This detail can only be determined by working up large scale lots in a throwing mill. However, tests show conclusively, that by immersing the skeins of raw silk in a bath of the emulsion as before outlined, a silk is obtained that possesses all the qualities of skeins ready for throwing.

The practical details, as worked out for treating raw silk with *"Nilsap"* is as follows:

FOR 100 POUNDS OF RAW SILK

weigh off two pounds of the composition, and make a thin cream of it with about five gallons of water heated to about 125° *F.*, then stir until no particles remain as lumps—all must break up, forming an emulsion. This emulsion is then added with constant stirring, to the vats or kettles in which the silk is to be immersed. These vats should be filled with proper amount of hot water, at about 100° *F.*, stir well, and then enter the skeins of silk. As silk has a tendency to float, a lattice may be placed in the vat to keep the silk below the surface of the liquor in the bath. Keep the temperature between 90 and 100° *F.*, and allow the silk to remain immersed over night. In the morning, remove the skeins from the bath, allow them to drain, and then hydro-extract them to remove the excess of soaking solution, and dry.

After drying, the skeins (containing the soapy and oily proportions of the emulsion) are then exposed to the action of free air so that the silk fibres may take up from the atmosphere the normal amount of moisture. They are then ready for winding.

Some throwing establishments permit the practice of winding the skeins while in a damp condition, and while we do not attempt to question the practice of any mill, this course is likely to be detrimental, since some portions of skeins may thus be drier than others, and cause thereby uneven winding, which has at times reflected upon the "kind of soap" and oils used by the throwster.

With this "Nilsap Composition" we believe that constant uniformity of output is assured, provided the throwster exercises care to wind under constantly uniform conditions.

No additions are found necessary to use in connection with this "composition," since it contains within itself, all the essential components to prepare the skeins for proper throwing, and is a distinct advantage over the usual compounds made in throwing establishments, where soaps and oils are weighed or measured, and combined together in the vat. It also appears to possess the advantage of not being liable to become rancid.

Nilsap is used by some of our most prominent public throwsters as well as weaving and knitting mills who do their own throwing. It is one of the specialties of the David McMeekan Manufacturing Company, 1070-1078 Pacific St., Brooklyn, N. Y.

FABRIC ANALYSIS.

Conditioning.

(Continued from March Issue.)

A Standard Condition for Testing.

Ever since the necessity for a definite knowledge of the strength of fabrics began to be felt, various means have been employed for testing them. For a long time proper allowances were not made for the factors entering into the conditions. Lately, however, owing to great divergencies of tests of the same materials, secured from various parties, a need of standardization has been felt, and, in fact, is considered now of the utmost importance.

We are presenting here a method for obtaining a standard condition which will be in line with the results achieved by the Bureau of Standards, and which is easy of application, costs little to install, can be operated at minimum expense, and gives entirely satisfactory results.

DEFECTS OF BONE-DRY TESTS.

The method advocated by certain parties known as the "bone-dry" method has numerous defects and disadvantages, the chief of which are:

FIRST: The fabric in this condition is entirely outside the usual working conditions for any, except tire purposes.

SECOND: The essential oils of the fabric are dried out and the structure changed to the extent that a test will not be a true measure of the behavior of this sample under conditions of use.

THIRD: The difficulty of securing a "bone-dry" condition with a multiplicity of samples increases in direct ratio to the number of samples to be tested, and in a large establishment makes a prohibitive condition.

A method of testing which secures satisfactory results without the disadvantages of the foregoing plan consists in maintaining a standard condition of regain in the testing room. It is a well-known fact, which has been demonstrated conclusively, that the laws of regain follow a definite line.

We herewith submit details of a test which covers an extended period of time and quite varied hygrometrical conditions of outside air, and embraces several thousand breaking tests.

AVERAGE STRENGTH—REGAIN 8¼%

	TEMPERATURE: 60-64°	65-69°	70-74°	75-79°
1 R X	81-58	82-00	80-96	79-60
2 D X	80-42	80-92	80-38	80-20
3 B R W	66-66	66-41	67-00	66-60
5 H S N	105-50	106-15	106-41	108-20
5 W	73-42	74-30	75-09	75-20
14 S W	112-25	116-55	116-81	114-00
17 N X	63-42	64-36	63-93	63-60
8 Y	177-83	172-33	177-68	185-60
Average	95-14	95-38	96-03	96-63
Average without 8 Y	83-32	84-38	84-37	83-91

This shows conclusively the fact that the strength of the fabric remains practically constant where the same percentage of regain had been maintained, irrespective of temperature, between reasonable limits.

Preparations for Testing.

The same are as follows: Use a regain scale constructed from a regular yarn balance, but in place of the pan for the samples use a wire rack on which samples similar to those to be tested are exposed. This scale is enclosed in a case made of fine woven brass wire cloth with a glass front, and can be set to indicate a regain of 8¼%, or any other desired. The samples exposed on the rack are trimmed to an exact weight of 200 grains, in absolutely bone-dry condition. This bone-dry state is obtained by exposing them in a drying oven at a temperature of 220 deg. *F.*, for a period of five hours. The scale beam is then made to balance *zero* with this bone-dry test sample on position on the rack.

The testing room is about 10*ft.* × 20*ft.* × 16*ft.*, and is equipped with a means of supplying humidity by artificial methods, and circulating the air. There is a rack on which to expose samples to be tested, and a shelf on which the regain scales are placed. In this room are the various yarn and cloth testing machines required in our investigations.

The regain scale is exposed in the testing room at the same time as the samples to be tested. Readings are taken periodically, and when the regain shows 8¼%, testing is begun. The humidifying apparatus is stopped or started during the continuance of the test, as may be necessary, to maintain this standard condition.

By referring to the results given in the table it will be observed that the strengths maintain a fairly constant value. The testing room is always in a livable condition, and operations can be conducted by a person without a great amount of scientific knowledge.

To Keep Yarn Numbers Uniform.

Investigations along this line have led us to a number of features which will be of interest to our manufacturing friends, the principal one of which is a satisfactory means of keeping numbers of yarns regular throughout the mills, irrespective of changes of hygrometrical conditions. The means employed are:

First, the installation of a regain scale, on which the amount of moisture in the air, and therefore (for example) in the cotton, is determined at any time. The weight of the picker laps is regulated according to this regain scale. Should the scale indicate a large amount of moisture, the weight of the laps is increased to a point to guarantee the same amount of cotton fibre that is desired in the normal condition of the room, and *vice versâ.*

The second feature is to have a central testing room, equipped as before, located convenient to the carding and spinning departments. Roving and yarn are sized in here, after being allowed to remain a sufficient time to come to the standard condition—seldom more than one hour. Card-room numbers are kept by these sizings. It will be found that few changes of gearing, either in carding or spinning departments, are necessary where this system is employed.

It will be found by employing this procedure that in many tests thus carried on the apparent change in weight of yarns will be surprising to those who have never investigated along this line themselves.

For instance, a test one day showed a number of samples of No. 20 yarn to size 19.72, and the next day, being very bright and windy, the same samples averaged 21.02 in size, a change of nearly 7%. This is quite a large apparent change in weight, while in reality the change consisted merely in the amount of contained moisture in the yarn.

Wear Resisting Qualities of Cloth.

It is considered by many people that there is a demand for an efficient machine for testing the wearing qualities of cloth, and a number of attempts have been made to produce one for this purpose.

A short statement of the ways in which cloth is subjected to wear may help to suggest some method of dealing with the matter.

Take first, outside clothing; this appears to be most subject to the rubbing of the cloth on another, and therefore if this could be imitated mechanically, perhaps that would meet the case.

Second, shirts and other under-clothing; washing affects the life of these kinds of cloths as much as the actual wearing, and as this entails a good deal of rubbing back and forth, a *to* and *fro* rubbing action might be employed; in addition to this there is the effect of the elbows, and the knees, and the shoulders, and to test this, one might suggest a machine with a boring action.

One of the earliest attempts to solve this problem was made by *Alcan & Tresca,* in 1858, and was intended to test the wearing qualities of felted and woolen fabrics. The cloth was placed in a frame with a rectangular opening and was subjected to the action of a flat brush, which always brushed in one direction, the brush being raised out of action for the return movement. The cloth was weighed before rubbing and was subsequently weighed after every 1,000 passages of the brush; in some cases the cloth was completely used up after 3,000 passages. The brush and the carriage weighed 26,750 *kilograms,* and the brush measured 0.185 by 0.240 *metres.*

Different types of machinery are used for ascertaining the wear resisting qualities of a cloth, namely,

(*a*) to and fro rubbing,
(*b*) boring, and
(*c*) cylinder rubbing.

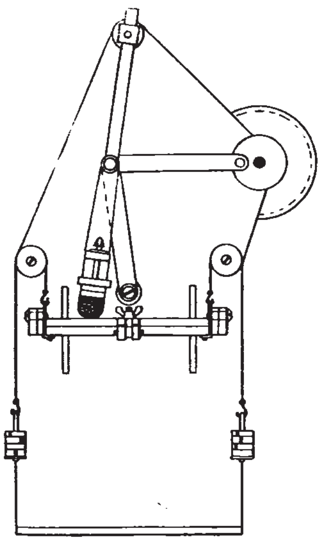

Fig. 88

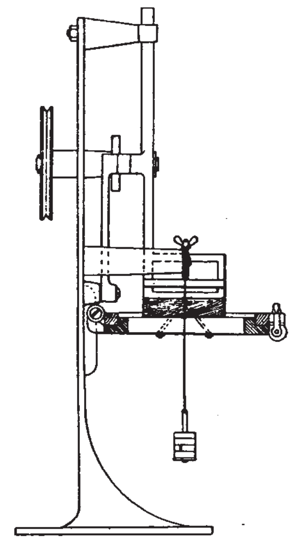

Fig. 89

To and Fro Rubbing.

The machine used for this test is shown in Fig. 88 in its elevation; Fig. 89 showing a side view, partly in section.

The surface which acts upon the fabric is knorled steel and to this surface a parallel motion is given, the stroke being one inch and the number of complete movements 200 per minute.

In order to make the machine as efficient as possible, a large number of experiments have been made and many disappointments have been encountered. The original stroke was 2½ inches, but that was reduced, as it was found that with the longer stroke the cloth was not worn equally.

Originally the sample to be tested was stretched in the square metal frame and secured by a skeleton lid, which was pressed upwards by a weighted lever in rather a different manner than that shown in the illustration. This plan of presenting the cloth to the rubber was found to be unsatisfactory for several reasons, the principal one being that the cloth became distended and the results of the rubbing were very irregular.

The next experiment consisted of filling the square with a piece of wood so that there was a solid bed for the cloth to rest upon and thus the stretching prevented. It was then found that the cloth was only rubbed at each end and the tests took a very long time.

The result of the protracted test seemed to be because practically only one set of threads was subject to the rubbing action, namely those lying at right angles to the path of the rubber, the other threads seemed to get in between the projections of the rubber and to suffer little or no injury. At this stage of the experiments it was decided to locate distinctly the portion of the fabric which had been rubbed, and after several trials, the present plan used was adopted, consisting of a raised piece in the middle of the square of wood, which effectually causes the cloth to be rubbed and to produce a fracture within a reasonable time.

There was still the difficulty of half the threads being at right angles and the other half parallel to the movement of the rubber, and it was therefore decided to place the sample in the frame on the *cross* and which has proved very successful.

The next point was to determine when the test was complete, and two plans suggested themselves; first to rub each sample for a fixed length of time under identical conditions, and then to compare their appearances at the end of the test; second to continue the rubbing until a hole appeared in the fabric. The first plan was discarded as it was considered that too much would be left to the judgment of the operator upon the relative conditions of the various samples at the end of the specified time.

Consequently upon the adoption of the second plan, some means had to be devised to enable the operator to state definitely when the cloth was worn through, and a piece of dark colored paper was put under the cloth before each test and as soon as the paper appeared the test was at an end, and the time occupied was recorded.

A large number of tests have been made on this machine and some of the test samples have been photographed and are shown in diagram *A* and *B* in Figure 90, to illustrate the kinds of fractures which were made in the cloth.

The time results, expressed in (*m*) minutes, of the tests are shown in figures given at the lower end of each sample and show as though this system of wear testing is one which is likely to be of service in testing the wearing qualities of cloth.

From the majority of the tests which have been made it is noticed that there is a consistent increase in the wear resistance coincident with the improvement of the quality of the cloth. The results also compare favorably with those which have been obtained from strength tests, provided the latter have been made.

THE DYESTUFF SITUATION IN THE TEXTILE INDUSTRIES.

(Continued from March Issue.)

Wool Manufacture.

The accompanying table summarizes the data for the consumption of dyestuffs and chemicals in 1913 and 1916 for 25 representative woolen and worsted manufacturers. Separate totals are given for 17 of the principal dyestuffs, the value of which amounted to 30 per cent in 1913 and 39 per cent in 1916 of the value of all dyestuffs and chemicals consumed by the 25 companies. Thirteen of these dyes are typical coal-tar products, while the remainder are natural or vegetable dyestuffs:

Dyestuffs Used by 25 Important Wool Manufacturers, 1913 and 1916.

Dyestuff.	Total Amount Used.				Average price paid per pound	
	1913		1916			
	Pounds	Value	Pounds	Value	1913	1916
Alizarin blue	869,695	$207,645	2,556,676	$1,541,085	$0.24	$0.60
Indigo	313,067	71,899	780,027	651,295	.23	.83
Sulphur black	192,920	55,580	548,843	565,822	.29	1.03
Direct black	111,500	41,221	133,890	82,867	.37	.62
Acid black	145,927	40,366	128,251	191,509	.28	1.49
Union blue	113,287	38,086	79,477	129,058	.34	1.62
Alizarin red	77,613	26,026	11,433	33,840	.34	2.96
Sulphur brown	44,822	24,468	10,152	11,006	.55	1.08
Diamond black	59,866	19,661	7,781	10,660	.33	1.37
Alizarin black	491,673	159,354	7,384	41,578	.32	5.63
Rhodamine	6,236	2,301	4,807	14,381	.37	2.99
Alizarin green	40,622	31,349	2,018	18,635	.77	9.25
Anthracene blue	702,788	148,962	1,831	12,404	.21	6.77
Alizarin brown	11,436	3,448	......	....	.30	....
Logwood & Hematine	712,656	59,589	4,472,424	1,355,145	.08	.30
Fustic	51,062	4,762	1,117,985	190,104	.09	.17
Sumac	91,896	3,163	73,272	6,956	.03	.09
	4,037,060	937,880	9,936,251	4,856,345	.23	.49
All other dyestuffs and chemicals	11,949,359	2,190,295	17,633,366	7,695,155	.18	.44
Total	15,986,419	$3,128,165	27,569,617	$12,551,500	$0.20	$0.46

Alizarin blue, which was the most important coal-tar dye in 1913, showed a remarkable increase in 1916. Since no true alizarin dyestuffs were being manufactured in this country in 1916 this can only be explained by the fact that a gallocyanine substitute of domestic production has been sold in large quantities under the commercial name of "alizarin blue." The increase in the consumption of indigo was made possible by the use of the natural or vegetable product and by the purchase of large quantities of the German synthetic indigo from second hands in China, Mexico, and elsewhere. Sulphur black, which shows an increase of 184.5 per cent in the quantities consumed, is primarily a cotton dye and the greater part of the amount reported in the table previously given was used by one woolen manufacturer who operates a large cotton department. Direct black is the only other coal-tar dyestuff which showed an increase for 1916. For the remaining coal-tar dyes there has been a decrease in the quantity consumed and a large increase in the average price per pound.

The two principal substitutions for dyestuffs of which there was a scarcity were the use of gallocyanine dyestuffs for alizarin and anthracene blue, and the use of logwood for various wool blacks. Other substitutions include: natural for synthetic indigo, natural or synthetic indigo for some acid blues, fustic and osage orange for alizarin yellow and some chrome yellows, and American-made sulphur blues for imported sulphur blues.

The opinions of eight representative manufacturers as to how American-made artificial dyes compare with the previously imported dyes are quoted below:

"Fastness and quality, class for class, are practically the same. Uniformity varies, being practically the same with some colors and some manufacturers, but inferior in other cases, probably due to experimental conditions in the industry."

"We have failed to get any domestic products that compare favorably as to level dyeing, strength, and uniformity with the dyes used by us prior to August, 1914."

"The dyes selected for manufacture by American makers were those that could be most easily made from the simpler intermediates that were available at the time, and for which there was a large demand among consumers. The dyes were of the same fastness as imported dyes of the same class, but in many instances the classes selected were those produced abroad many years ago and possessing very poor fastness properties. Scarcely any of the modern fast dyestuffs produced abroad during the last quarter of a century have been made up to the present time (August, 1917) in this country. Indigo is an exception to the above, but little has been produced."

"While the American colors for cotton have been brought out in profusion, the wool colors have been more limited, and we have been forced to purchase odd lots of the old imported dyes from time to time at fancy prices to be used sparingly for decorative purposes."

"The quality and uniformity of the dyestuffs at the outset were poor, but there has been a marked improvement of late so that present deliveries are approaching the quality and uniformity of the dyes that were formerly imported. There is, however, room for great improvement in the class of colors manufactured."