FABRIC ANALYSIS.

(Continued from February issue.)

Conditioning Unscoured Material.

In some cases unscoured or dirty material has to be conditioned, and when besides ascertaining the percentage of moisture in the sample, we must also ascertain the percentage of yolk, dirt, gum and other foreign matter. The percentage of oil in tops, yarns, or fabrics is also often

required to be known.

For this purpose a sample is carefully weighed, then thoroughly scoured with a neutral soap and water to which a little ammonia is added, dried, cleansed, and shaken to rid it of sand, lime, etc. It is then made absolutely dry in the conditioning oven, as previously explained, its weight again recorded, and subtracted from the first weight taken, the difference giving the amount of foreign matter, plus the moisture the sample contained.

Silk Conditioning.

In conditioning of silk, besides ascertaining the percentage of moisture present it may be necessary to also obtain the percentage of gum or sericin before the true weight of the fibroin the silk contains can be given. This gum, which is fibroin the silk contains can be given. This gum, which is the natural product of the silkworm, is poured by the latter on to the fibre during the spinning of its cocoon, and usually amounts to about 18 to 25 per cent, depending upon the kind of raw silk, China silk containing the most.

Thrown silk yarns are supplied either boiled-off (that is with all the gum removed) or as gum-yarns, in which case only a portion of the gum will have been removed, the proportion varying according to the purpose to which the yarn is Thus souple silk has only from 6 to 12 per cent to be put. of the gum removed, whereas silk known as ecru has only as little as possible removed, consistent with the success of the bleaching of the material, say from 3 to 5 per cent.

SPUN SILK, which is made from the waste of raw silk, is

supplied as ordinary spun silk in which the gum is all boiled out, or as schappe or floss silk in which the gum is retained. The usual process of testing a silk sample as to moisture

and boil-off consists of first weighing a sample on a pair of most delicate scales, then finding the absolute dry weight by placing it in the dessicating apparatus, which has been previously explained, but smaller. The dry sample is then immersed twice in a bath of boiling soap suds, 1/4 lb. of silk soap being used to each pound of silk, for a half hour, after which the heat should be permitted to run down, the sample afterwards being washed in a current of cold water to remove

The sample is then conditioned a second time, and when then the difference between the absolute dry weights before and after boiling gives the amount of moisture and gum that was present, and from which the percentage of loss can be

readily calculated.

Count in Correct Condition.

The moisture in the air of the room at the time of this testing for the count of the yarn (or weight of fabric) "in correct condition", i.e., conditioning as you technically call it, has no influence on the result of the test; that is to say, several tests might be carried out on the yarn under widely varying conditions with regard to moisture, and assuming there to be no natural variation in the count of the yarn, the "count in correct condition" would always be the same.

Count in Condition Received.

On the other hand, in the case of a test for "count in condition received," that is, count of yarn without correction for moisture, the result of the test will vary according to

1), the moisture in the sample, and

(2), the atmospheric conditions prevailing at the time the test is made.

When a sample is tested in a damp state, the result will show the varn to be coarser than is actually the case, whereas a test of yarn in a dry condition will give a result finer than

the true count.

For the purpose of investigating the effect of variation in the amount of atmospheric moisture on the count of a yarn, a sample of a normal gray cotton yarn, after being accurately weighed, was placed in a cage specially designed so as to expose the sample as freely as possible to the atmosphere of the testing room, but at the same time to afford the maximum amount of protection from dust and dirt. The sample was weighed at frequent intervals during a period of about three months, and the weights recorded. Hygrometric

readings were also taken during the same period, and the variation in the weight of the test portion of varn was found to be generally coincident with the variation in the amount of atmospheric moisture. As was to be expected, however, there was a certain amount of time lag due to the condition of the test portion not coming immediately into equilibrium with the condition of the air.

At the end of the period during which the yarn was exposed, and after the final weighing, the sample was dried and the absolute dry weight ascertained. From this, the percentage of moisture in the yarn at the time of each preceding weighing was calculated, and the results showed the moisture to have varied approximately from 6 to 10 per cent.

Assuming the yarn to have been 40's, tests for count at different times during the period in question would have shown an approximate variation of from 39's to 41's. That is to say, if tested on the most humid day during the three months, the yarn would have been found to be 39's, whereas if the test had been made on the driest day, it would have shown the yarn to be 41's.

Although the true count of a yarn may be ascertained from a test of the material "in correct condition," tests of strength of yarn and cloth are commonly carried out on the material in its ordinary air-dry state. It is generally recognized by manufacturers that the strength of yarn and cloth varies to some extent according to the amount of moisture in the material, and in some works, strength tests are never made unless the samples have been previously exposed to the air in order that they may gain or lose moisture, and come to a supposed natural condition. No method of testing however, has been generally adopted which obviates the discrepancies in the results of tests arising from variation in the amount of atmospheric moisture in materials at the time of testing. It has been stated that, in the case of flax canvas purchased by some foreign governments, it is stipulated that before testing for strength, the material shall be subjected to a certain temperature for a stated time. Objections may be raised to this procedure, however, since it is possible that physical changes may be brought about by the heat used in drying, and, on cooling, the material may not be in its natural condition.

With a view to determining the effect of atmospheric moisture on the strength of cloth, a series of tests have been carried out some time ago by the Manchester Testing House on wool, cotton, and linen cloths, and the results obtained show that the degree of strength possessed by these materials depends to a considerable extent upon the conditions of the atmosphere to which the cloth is exposed prior to testing.

Having regard to the variation in strength usually found from place to place in a piece, it was necessary for the purpose of this investigation that special precautions should be taken so as to reduce to a minimum any natural variation in strength existing from one test portion to another. cloth was tested in the direction of the warp only, in order that the strength of the test pieces would not be influenced by the accidental presence of mixed filling yarn, or by variation in the number of picks per inch due to irregular beating-up in weaving, a piece of cloth, measuring several yards in length was cut into six strips in the direction of the warp. Each strip was of such length as to provide about thirty test pieces, which could be cut off as required. The strips were pieces, which could be cut off as required. numbered before being divided, so that the exact position in the cloth of any particular test portion could (if desired) be ascertained after the tests had been made.

The strips were so prepared that each had the same number of threads in its width, and they were then exposed in the testing room, the necessary sized test piece being cut from each of the six strips, and the remaining portions left exposed to the air for subsequent tests whenever the moisture conditions of the air showed a change from those prevailing at the time of the previous test. The tests were not made at strictly regular intervals, but only after the hygrometer readings showed a change to have taken place in the relative humidity of the air.

A serge of the type used for military uniforms was selected to represent the wool cloth, while an ordinary gray cotton drill and a flax canvas were chosen as typical of the cotton and linen cloths which are frequently brought to a specification strength.

Comparison of the highest and lowest results obtained in each of the series of tests show that, when tested in their assumed normal air-dry condition, the average strength of the materials varied to the extent of 14 per cent in the wool cloth, 12 per cent in the cotton cloth, and 18 per cent in the flax canvas.

SUMMARY OF TESTS.

Average of six tests in each case.													
Relative		Vool (Serg		otton (Dr		lax (Canvas).							
Humidity		Average		Average		Average							
of the Air.		Strength.		Strength		Strength.							
Per cent.		lb.		lb.		lb.							
44		186		521		599							
47		181		538		637							
56		180		527		652							
5 7		173		545		650							
59		174		541		650							
60		175		531		639							
62		175		550,		669							
65		169		552		681							
66		173		563		687							
68		173		551		661							
70		159		571		702							
71		173		568		712							
72		168		569		688							
75		168		582		710							
<i>77</i>		165		581		710							
82		160		592		729							

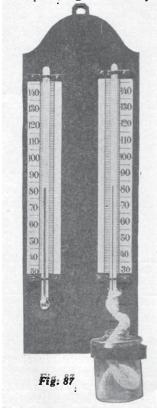
It cannot be claimed, however, that the foregoing results should be accepted as showing the precise and definite degree of variation in count and strength, consequent upon the percentage of moisture in the air, or in the sample, at the time the test is made, as no universally recognized standards of

variation in count, twist, and strength exist.

If the amount of moisture present in the air can influence the count of yarn to such an extent as to show an actual 40's yarn as 39's on a humid day, and 41's on a dry day, and to influence the strength of cloth from 12 to 18 per cent, and possibly more, it would seem unreasonable that exception should be taken to goods which fall short of a contract or specification by these amounts, unless reliable tests have been carried out under stated and agreed conditions of humidity.

Hygrometer.

The dew point is the foundation for the estimation of humidity or moisture in the air and for which reason we must know this before the percentage of humidity in a room can be



There is Absolute, Maximum and Relative The first means the actual amount of vapor present in a given volume of air; the second means the amount of vapor that could be present in the same volume of air under precisely the same conditions of pressure and temperarture, whereas relative humidity means the ratio of the absolute to the maximum humidity and is the one we are mostly concerned with in connection with textile problems.

The instrument for measuring the degree of relative humidity, i.e., drying power of the atmosphere, as we may say, is called psychrometer, or wet bulb hygrometer or hygrometer for short and of which a perspective view is given in Fig. 87. From the same it will be seen that the apparatus consists of two delicate thermometers placed near each other, the bulb of one of which is kept wet by being covered with a piece of muslin, the end of which (a kind of wick) dips into a small vessel filled with water.

It is one of nature's laws that when anything evaporates, it absorbs heat, therefore, the water evaporating from the wick which surrounds one of the bulbs of the Hygrometer, absorbs or draws out the heat from the thermometer, thus lowering the temperature. The dryer the air, the faster the water evaporates from the bulb and the greater the difference would be between the two thermometers. If the air would be perfectly saturated with moisture, there would be no evaporation taking place from the wick, and consequently the

two thermometers would read exactly alike.

After ascertaining the difference between the two thermometers, by consulting table given herewith, the relative humidity may be read off direct.

AIN TREPERA-	E Difference Briwers the Dry and Wet Thermometers.																														
1		1	; 2	: 3	: 4	5	6	. 7	8	. 9	: 10	11	112	: 13	14	: 15	16	17	18	: 19	30	21	22	23	24	25	26	27	28	29	31
-	200	94	188	84	78	73	68	63	58	53	46	44	39	34	30	26	22	16	14	10	6	2		_	_		Г	Ι.			Ē.
45	100	91	90	85	80	75	70	65	61	56	52	48	44	39	35	31	28	24	20	. 17	13	19	6	1 3			Г	_	_	_	-
70	100	90	90	86	81	77	72	66	64	-	55	2	46	44	40	36	33	29	26	23	19	16	13	10	7	4	1		l-i	$\overline{}$	iΤ
75															44	40	37	34	31	27	34	31	19	16	13	10	7	5	2	!	1-
80	100					79									47		41	38	35	22	29	26	23	20	18	15	13	10	8	6	1
85	100									- 66	63		54	52	50	47	-	41	-	-	33	30	28	25	23	20	17	15	13	u	1
90	100					81					45		-	54	52	-	a	44	41	30	36	94	32	29	26	34	22	30	17	15	11
-	bee					83					-	=	-	56	55	52		67	44	42	20	27	25	22	30	28	25	23	21	19	ľ
100	100					83					-	86	-	80	57		<u></u>	-	47	44	42	20	37	36	33	81	39	27	25	33	2

As, for instance, if the temperature in the room was 100 deg. F. according to the dry thermometer and the wet thermometer read 85 deg. F., i.e., a difference of (100-85=)15 deg., then follow the air temperature column down to the 100 mark, and then follow that line out to the right until the 15th = 54 per cent humidity.

In the use of hygrometers, attention must be given to:
(a) The muslin, covering the wet bulb, must be kept in good condition; the evaporation of the water always leaves a small residuum in the meshes, wihch inevitably causes stif-

fening of the material, preventing the proper taking up of the water. Hence, use as pure a water as possible, and renew the muslin covering from time to time.

(b) Have the wet bulb 4 inches or more apart from the dry bulb, and the well of water at least 5 inches, in order to prevent the dry bulb being affected by evaporation.

(c) Have the gradations cut on the stems of the thermometers, and have them properly tested before being put to use in the mill. A defect in many makes of hygrometers is to have the spherical bulbs of the thermometers too long to adapt themselves quickly to the changes of temperature.

There are also direct reading hygrometers in the market, in which by merely setting the pointers to the wet and dry bulb temperatures, the humidity of the air is obtained on the scale. The apparatus operates as follows: On setting the pointers, the difference between the wet and dry bulb thermometers is obtained. A slotted bar at the back of the instrument multiplies this reading by a factor which obtains the dew point. The scales are so chosen that the vapor tensions corresponding to the dry bulb temperature and dew point are found. These are divided and the result multiplied by 100, thus finding the humidity. It will, of course, be understood that the instrument, by means of the pointers, slots, and special scale, performs all these operations at one

Moisture Absorbing and Retaining Qualities of Cloth.

Fabrics composed of different fibres or treated in different ways have greater or less hygroscopic powers, and in the making of certain types of cloth it would be well to know to what extent fabrics made in certain ways attract and retain moisture, so that if possible or desirable, alterations could be made to increase or to diminish these features.

In order to determine the hygroscopic properties of cloth, the apparatus shown at Fig. 88 is suggested. The cloth is first weighed, then subjected to steam from boiling water for a given period during which time shot is added in the lower pan to balance the amount of moisture taken up by the cloth. This is poured out and weighed and the cloth is dried until the first weight is balanced.

(To be continued.)