Water-repellent finishing:
The requirement is a water-column of 200mm according to Schopper.

1. **The fabric is treated three times on a three-roller pad with 80 grams of Persistol NO/1 and dried on the drying cylinder. A water column of approximately 180-250mm is obtained.**

2. **The fabric is padded twice on a three-roller pad with**

40 grams of Persistol Base B) per
plus 10 grams of Persistol Salt conc.) litre

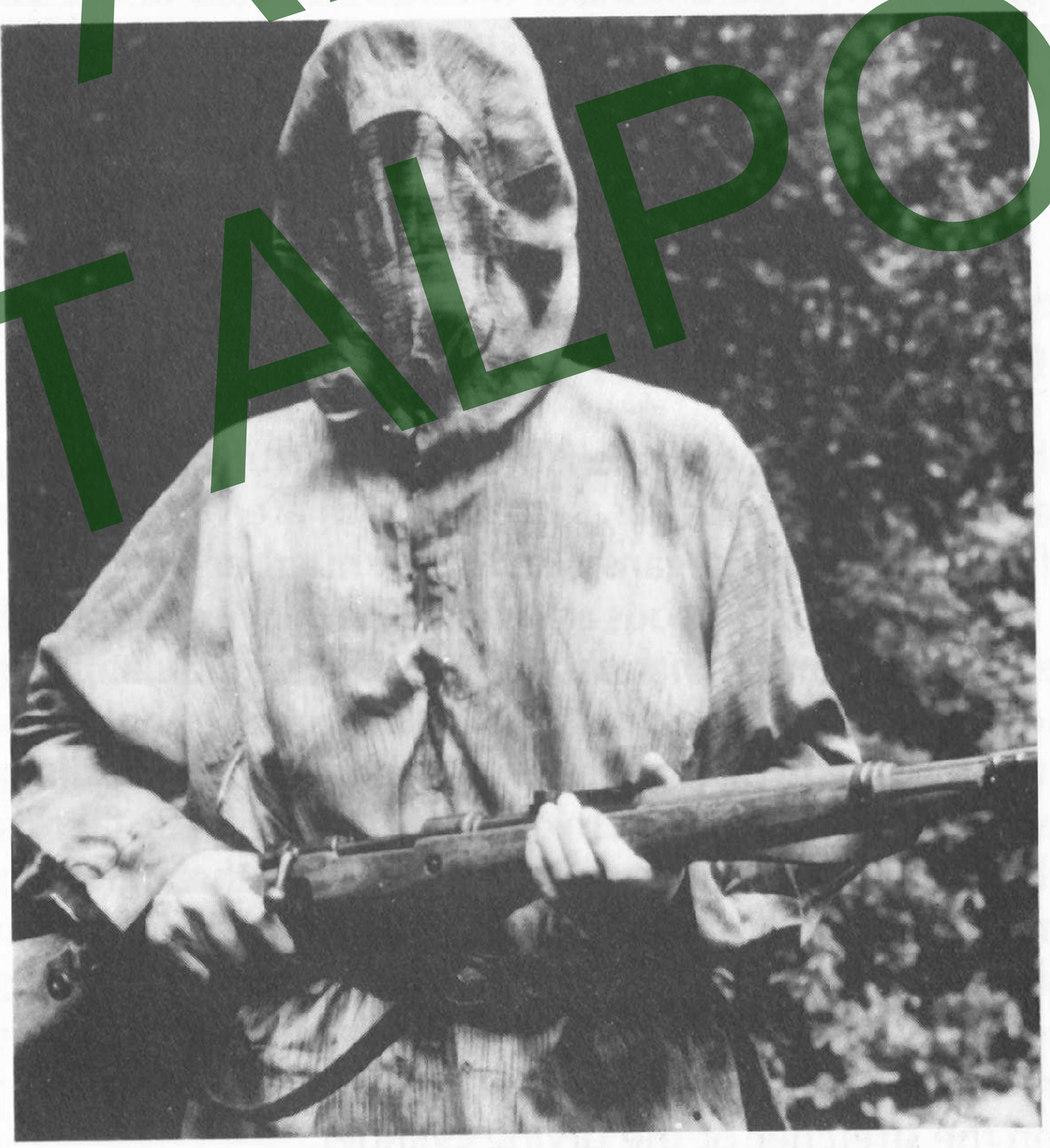
and dried on the drying cylinder or tenter frame.

MIXTURE FOR 100 LITRES OF LIQUOR:

4 kg	**Persistol Base B are dissolved with**
25 litres	**water of 80°C and stirred into a solution of**
1 kg	**Persistol Salt concentrated in**
20 litres	**water**

The whole is cooled to 40°C by means of

45 litres	**cold water**
0.9 kg	**crystallised sodium acetate, dissolved in**
8 litres	**water slowly added. Finally**
1 litre	**acetic acid of 30% strength (6°Bé) is added and the whole is adjusted to**
100 litres	



Linen Drill, Winter Camouflage Clothes for the "Waffen-SS"

Fabric:

1. **Linen drill made from spun rayon, flax tow and mixed yarn.**
   Weight of the raw material, length 100m, width 80cm: 18-20kg
   Width, raw: 80cm
   Width, finished: 76-78cm

2. **Spun rayon of high fastness to wet processing for camouflage clothes:**
   Weight of the raw material, length 100m, width 150cm: 50kg
   Width, raw: 150cm
   Width, finished: 136-137cm

Preliminary treatment:
The closely woven fabric is usually treated at full width in order to avoid creases and breaking. The raw material is boiled on the jig or the full width washing machine with

0.5-1 gram Igepon or Igepal
2 grams calcined sodium carbonate or soda lye of 32½% (38°Bé)
1-2 grams Nekal BX extra per litre

After boiling the fabric is rinsed hot and cold. Then it is dried on the drying cylinder or on the stenter, brushed and stentered.

Printing:
On the one side the goods are padded yellow-brown (khaki) by means of anthrasols whereas the other side is printed with five colours.
The new pattern is produced by machine printing with Indanthren dyestuffs, but it is also printed with Anthrasol dyestuffs according to the nitrite process. With the anthrasol printing process it is, for example, possible to print at first for a whole week only one side of the fabric and to batch up the non-developed fabric whereupon, in the following week, the reverse side may be printed. This offers favourable possibilities of production.

INDANTHREN PRINTING PASTES:

Light-brown	Green	Olive	
100 grams	— gram	80 grams	Indanthren Printing Brown TMZ Suprafix paste
5 grams	75 grams	80 grams	Indanthren Golden Yellow RK Suprafix double paste
— gram	75 grams	— gram	Indanthren Brilliant Green 4G paste fine concentrated
— gram	— gram	25 grams	Indanthren Brilliant Green B paste fine concentrated
245 grams	180 grams	145 grams	water
80 grams	80 grams	80 grams	Glycinal HD
350 grams	350 grams	350 grams	potato-starch-Cellapret dry thickening agent
120 grams	120 grams	120 grams	potash
100 grams	120 grams	120 grams	Rongalit C
1kg	1kg	1kg	

Dark-brown	Dark-green	
80 grams	90 grams	Indanthren Black Brown R paste for printing
100 grams	— gram	Indanthren printing Brown TMZ Suprafix paste
— gram	70 grams	Indanthren Blue Green FFB Suprafix double paste
— gram	50 grams	Indanthren Brilliant Green B paste fine concentrated
— gram	25 grams	Indanthren Golden Yellow RK Suprafix double paste
170 grams	120 grams	water
80 grams	100 grams	Glycinal HD
350 grams	300 grams	potato-starch-Cellapret dry thickening agent
120 grams	120 grams	potash
100 grams	120 grams	Rongalit C
1kg	1kg	

Steaming and development are as usual for Indanthren printing.

ANTHRASOL PRINTING PASTES:

Light-brown	Green	Olive	
10 grams	40 gram	40 grams	Anthrasol Golden Yellow IRK
— gram	15 grams	10 grams	Anthrasol Green IB
42 grams	6 grams	25 grams	Anthrasol Brown IBR
10 grams	— gram	— gram	Anthrasol Brilliant Orange IRK
100 grams	120 grams	120 grams	Dissolving Salt CN
20 grams	30 grams	30 grams	Fibrite D
250 grams	250 grams	250 grams	hot water
20 grams	— gram	— gram	urea
20 grams	20 grams	20 grams	calcined sodium carbonate 1:10
350 grams	350 grams	350 grams	potato-starch Cellapret dry thickening agent
60 grams	50 grams	60 grams	sodium nitrite 1:2
118 grams	119 grams	95 grams	cold water
1kg	1kg	1kg	

Dark-brown	Dark-green	Yellow-brown-padding	
60 grams	55 grams	22 grams	Anthrasol Brown IBR
7 grams	— gram	— gram	Anthrasol Blue IBC paste
— gram	10 grams	15 grams	Anthrasol Golden Yellow IRK
— gram	40 grams	— gram	Anthrasol Green IB
— gram	15 grams	— gram	Anthrasol Grey IBL
100 grams	120 grams	80 grams	Dissolving Salt CN
20 grams	30 grams	20 grams	Fibrit D
250 grams	300 grams	250 grams	hot water
20 grams	20 grams	20 grams	sodium carbonate calcined 1:10
350 grams	350 grams	350 grams	potato starch-Cellapret dry thickening agent
50 grams	60 grams	50 grams	sodium nitrite 1:2
143 grams	— gram	193 grams	cold water
1kg	1kg	1kg	

Consumption of printing pastes for 100 sq.m.: 10-11kg (without Yellow-brown-padding)

The fabric printed on both sides and dried is steamed for 3-5 minutes in the rapid ager, then developed on full width washing machine:

1st trough (acid-proof of pitchpine or lined with lead-plate):
20cc of sulphuric acid of 66°Bé per litre at 70°C plus 2 grams of Anthrasol Salt NO
Time of passage: 20-30 seconds.

2nd and 3rd trough: spray with cold water and rinse

4th trough: neutralise with 2 grams of calcined sodium carbonate per litre

5th and 6th trough: rinse.

In order to remove the thickening agent the developed fabric before soaping may be run through a solution of Biolase N18 powder or Viveral E extra and desized. The fabric is allowed to lay, for instance overnight and is rinsed on the next day.

On the second passage through the full width washing machine the material is treated hot with an Igepon- or Igepal-brand and sodium carbonate, rinsed and then dried on the stenter.

Water-repellent finishing:
The requirement for linen and mixed yarn-drill 260mm of water column, for camouflage clothes 400-450mm water column according to Schopper.

a) **The fabric is treated three times on a three-roller pad with 80 grams of Persistol NO per litre and dried on the drying cylinder or tenter frame.**

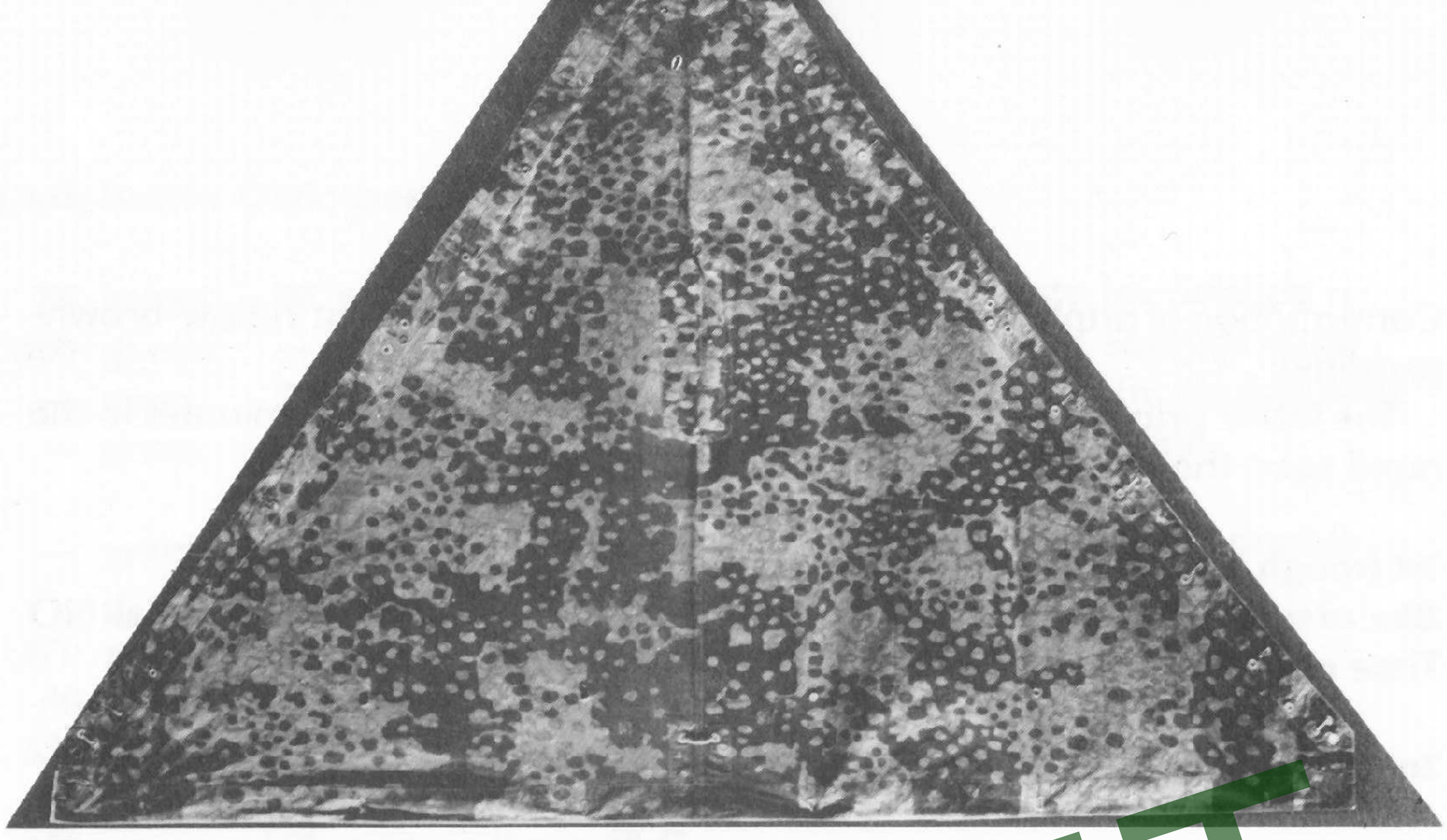
b) **The fabric is padded twice on the three-roller pad with**

40 grams of Persistol Base B) per litre
plus 13 grams of Persistol Salt concentrated)

and dried on the drying cylinder.

BATCH FOR 100 LITRES OF LIQUOR:

4 kg	**Persistol Base B are dissolved with**
25 litres	**water of 80°C and stirred into a solution of**
1.3 kg	**Persistol Salt concentrated in**
20 litres	**water. The whole is cooled to 40°C with**
45 litres	**cold water**
0.9 kg	**crystallised sodium acetate, dissolved in**
8 litres	**water added slowly. Finally**
1 litre	**acetic acid of 30% strength (6°Bé) is added and the whole is adjusted to**
100 litres	



SS Shelter Half

Fabric: 33/67 Spun rayon-cotton-mixed fabric
Width, raw: 140-145cm
Width, finished: 132-134cm
Weight of the raw material for 100m,
width: 140cm, corresponding to the yarn thickness and to the setting of the goods from 37.5 to 42.5kg.

Preliminary treatment:
The closely woven fabric is usually treated in full width, since creases and breaking cause unremovable roughening of the fabric. Jigs, open soaper, drying cylinder, printing machine and ager have, therefore, to be adjusted for handling goods of a width of 140-145cm, and their working width has to amount to 160cm.

Attempts have been made to avoid the process of boiling with Igepal and soda, in order to obtain a finished fabric showing an increased water repellence and standing a higher water column according to Schopper. This change, however, to a short desizing and chlorinating of the goods, provoked irregular wetting and levelling during the printing process.

At first the fabric is desized on the jig.

DESIZING LIQUOR FOR 100kg OF GOODS:
300 litres of water (temperature: 45°C - 70°C)
200-400 grams of Biolase N18 powder or C18 liquid
75-150 grams of Nekal BX extra

The fabric is repeatedly passed through the liquor. The batch of fabric is then wrapped in cloths in order to prevent drying of the borders. For desizing the goods are allowed to stand for several hours or during the night.

DESIZING OF 100kg OF THE FABRIC WITH VIVERAL E extra:
300-350 litres of water (temperature: 45-50°C)
0.8-1kg Viveral E Extra
75-150 grams of Nekal BX extra

The Viveral is introduced into five times its weight of cold water, while stirring. The mixture is diluted with warm water until a solution is obtained. When using Viveral the temperature is by no means allowed to exceed 55°C. The desizing is then carried out as described above.

Boiling:
Recently a separate desizing is often omitted; the raw fabric being boiled on the jig or on the open soaper with

0.5-1 gram Igepon or Igepal)
2 grams calcined soda or caustic soda lye) per litre
1-1.5 grams Nekal BX extra)

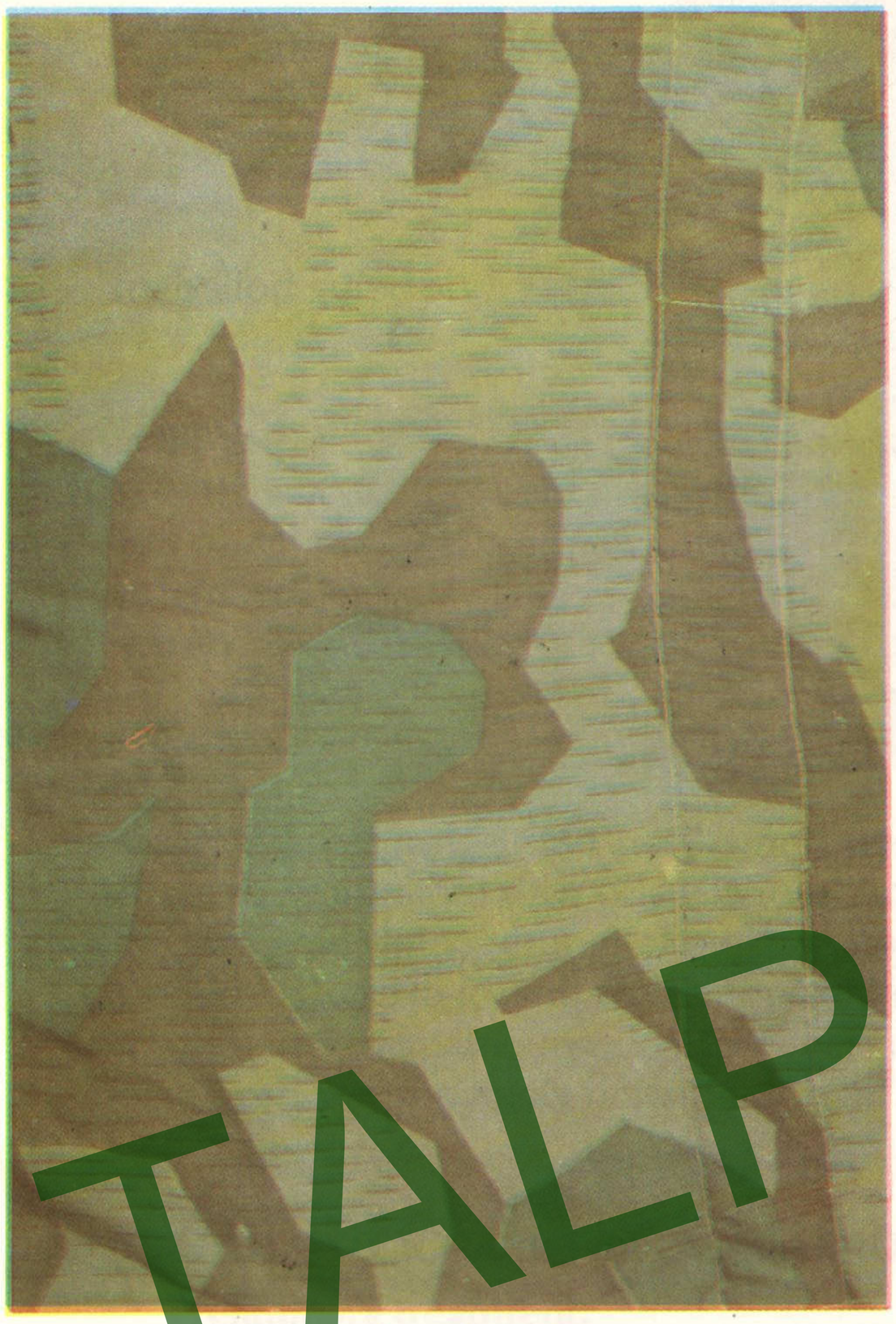
After boiling, the goods are rinsed hot and cold. Formerly the fabric was partly bleached in a mild bath of sodium hypochlorite or by means of hydrogen peroxide, acidulated, and rinsed. Finally, the goods are dried on the drying cylinder, brushed and stentered.

Printing:
The SS-fabric is film-printed (screen printed) on both sides in three colours usually with Anthrasol dyestuffs, occasionally also with Indanthren dyestuffs. Of late this article is also produced by simultaneously combining machine printed Indanthren dyestuffs with film-printed Anthrasol dyestuffs, the large dark areas being either bottom-printed or subsequently overprinted with Anthrasols by means of screens. This combination yields a larger production than screen printing alone.

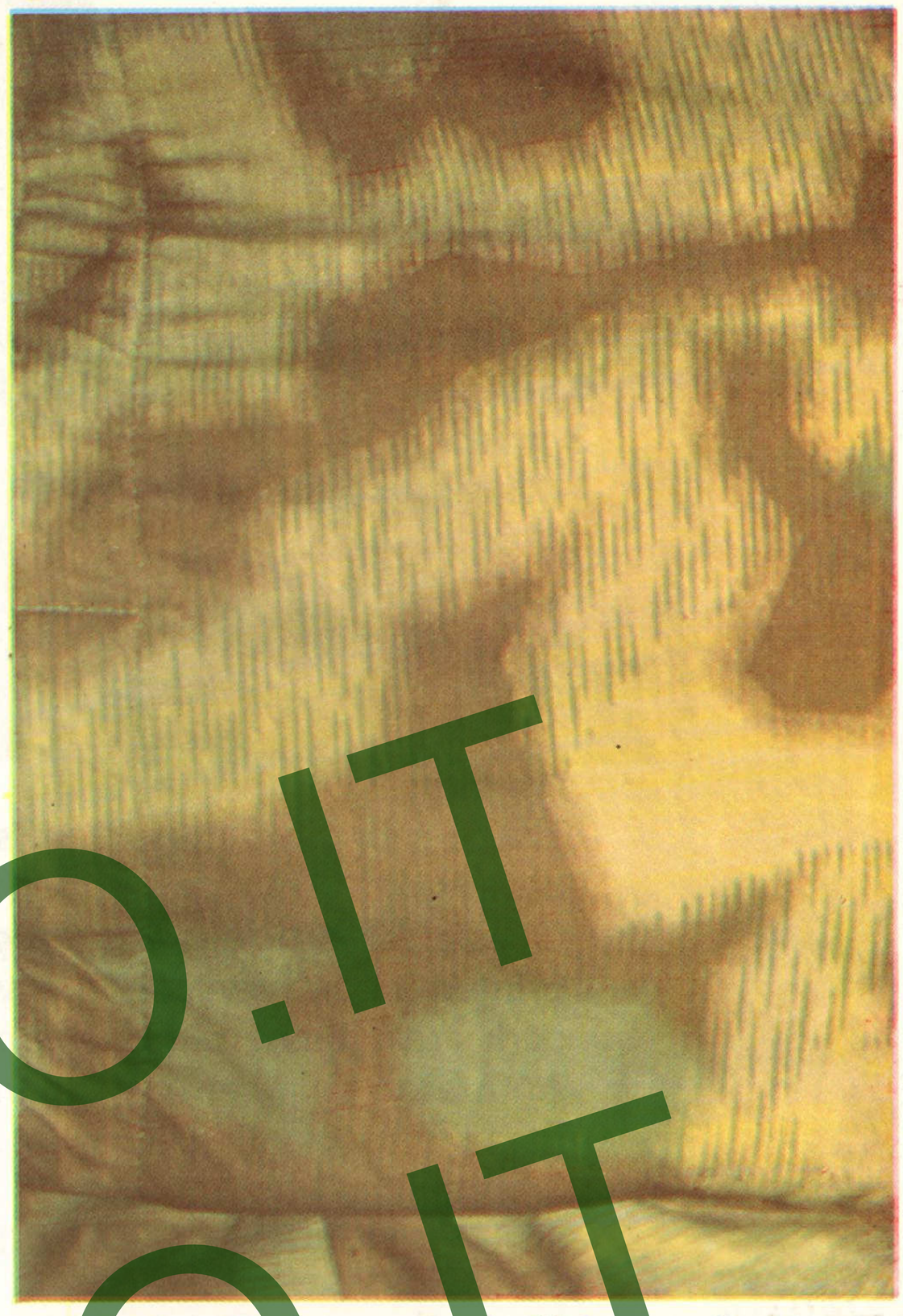
SCREEN-PRINTING COLOURS CONTAINING ANTHRASOL DYESTUFFS:

Dark-green		Leaf green		Brown ground		
60	grams	3.5	grams	23	grams	Anthrasol brown IBR
15	grams	6.5	grams	—	grams	Anthrasol green IB
—	gram	16	grams	0.6	grams	Anthrasol Golden Yellow IRK
—	gram	—	gram	3.0	grams	Anthrasol Blue IBC paste
100	grams	120	grams	80	grams	Dissolving Salt CN
30	grams	20	grams	20	grams	Fibrite D
190	grams	229	grams	268	grams	hot water
275	grams	275	grams	275	grams	Cellapret thickening 1:7
250	grams	250	grams	250	grams	British gum 1:1
20	grams	20	grams	20	grams	calcined soda 1:10
60	grams	60	grams	60	grams	sodium nitrite 1:2
1kg		1kg		1kg		

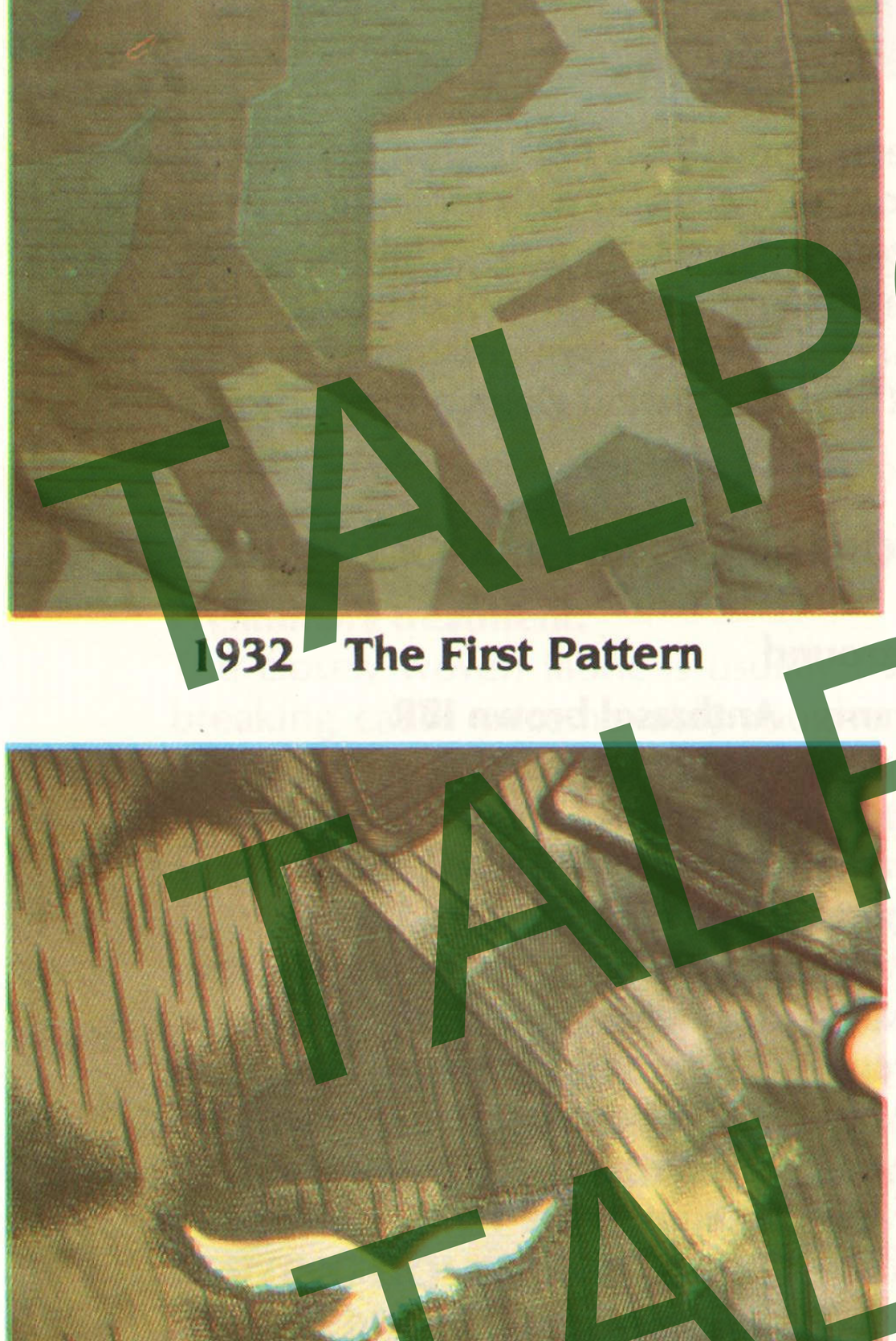
Dark-brown		Leaf green		Brown ground		
41	grams	19	grams	17	grams	Anthrasol brown IBR
12	grams	—	gram	5	grams	Anthrasol Blue IBC paste
—	gram	7.5	grams	0.5	grams	Anthrasol Golden Yellow IRK
180	grams	100	grams	80	grams	Dissolving Salt CN
30	grams	30	grams	20	grams	Fibrite D
132	grams	238	grams	272	grams	hot water
275	grams	275	grams	275	grams	Cellapret thickening 1:7
250	grams	250	grams	250	grams	British gum 1:1
20	grams	20	grams	20	grams	calcined soda 1:10
60	grams	60	grams	60	grams	sodium nitrite 1:2
1kg		1kg		1kg		



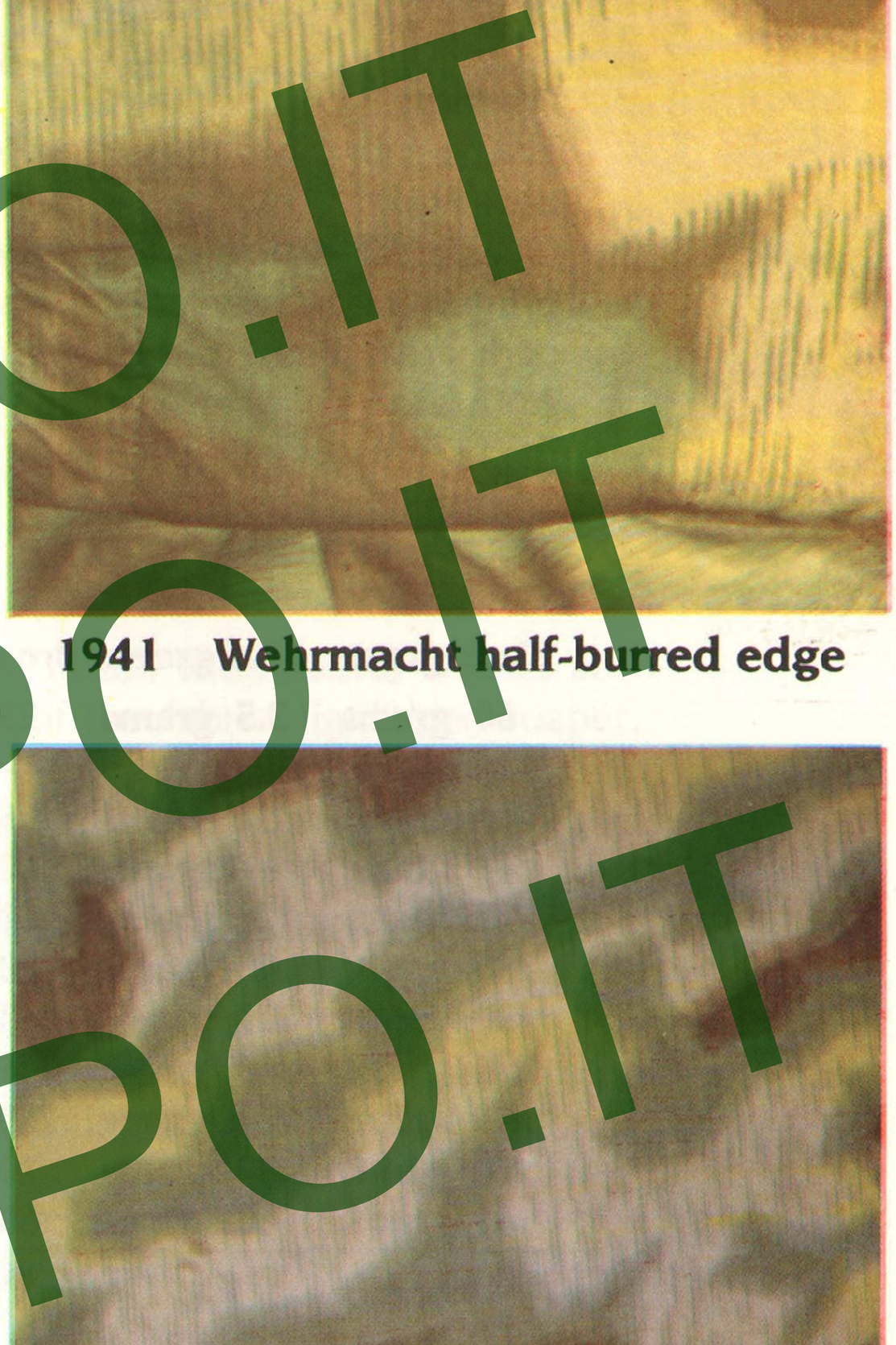
1932 The First Pattern



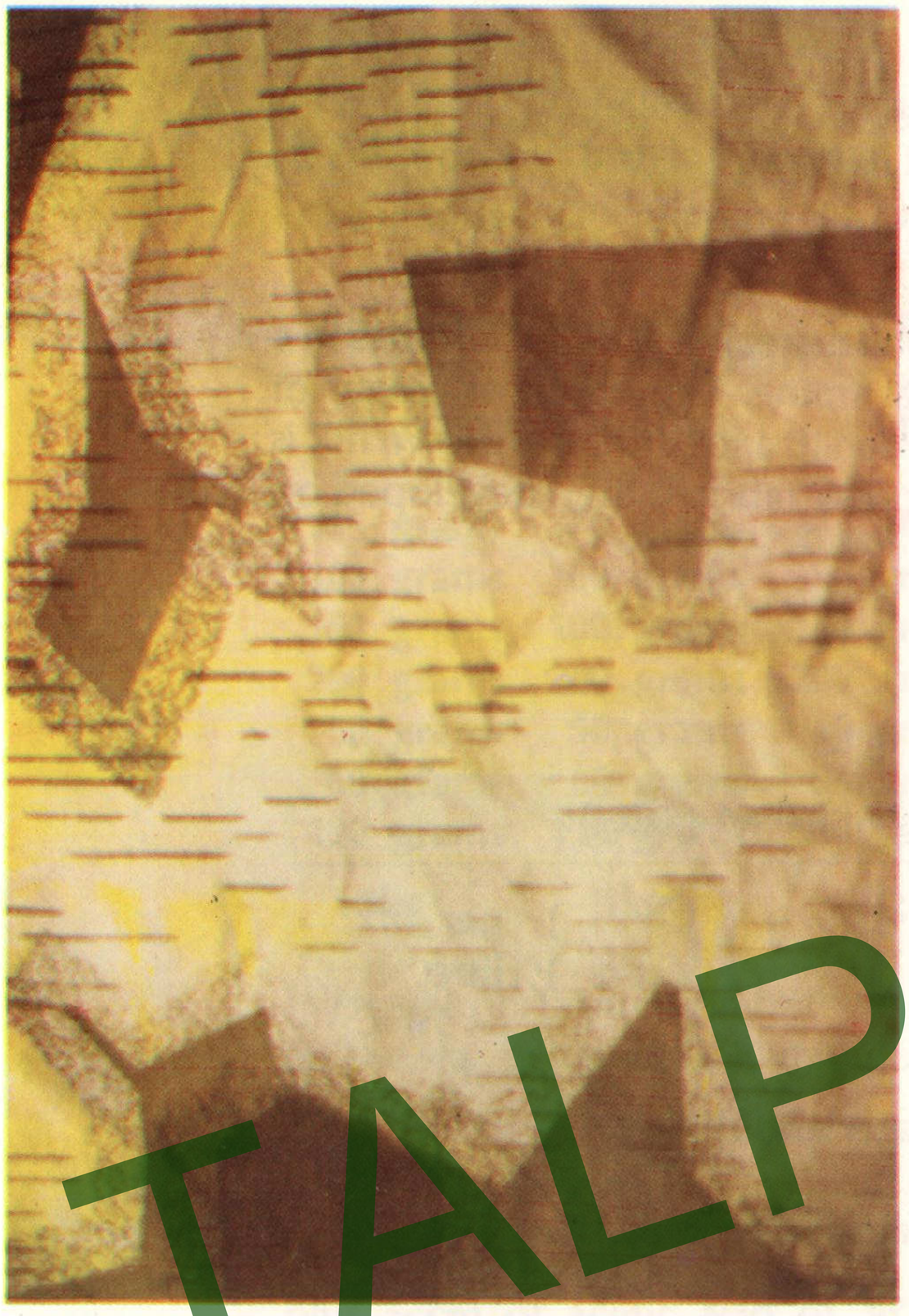
1941 Wehrmacht half-burred edge



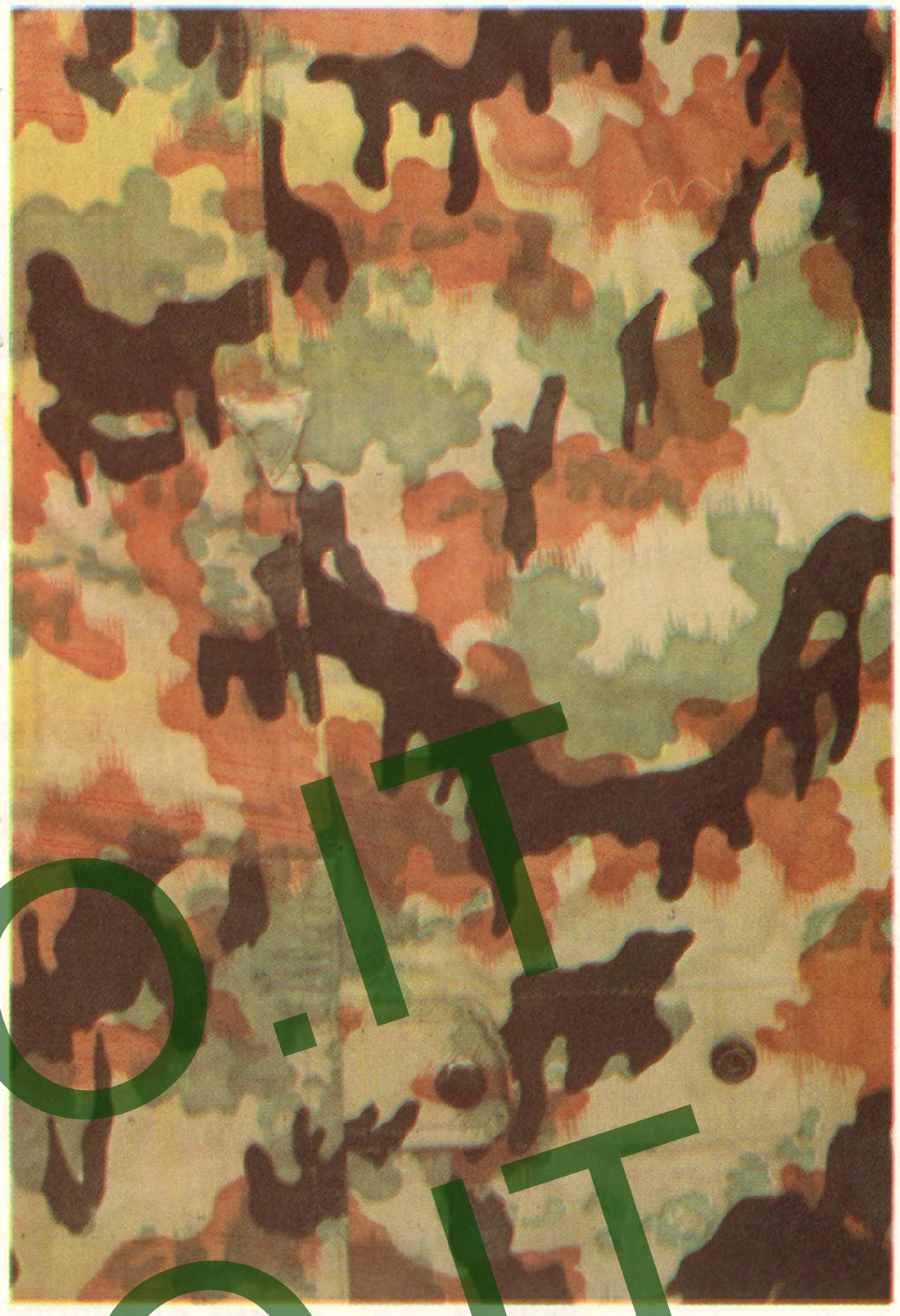
1942 Luftwaffe Pattern



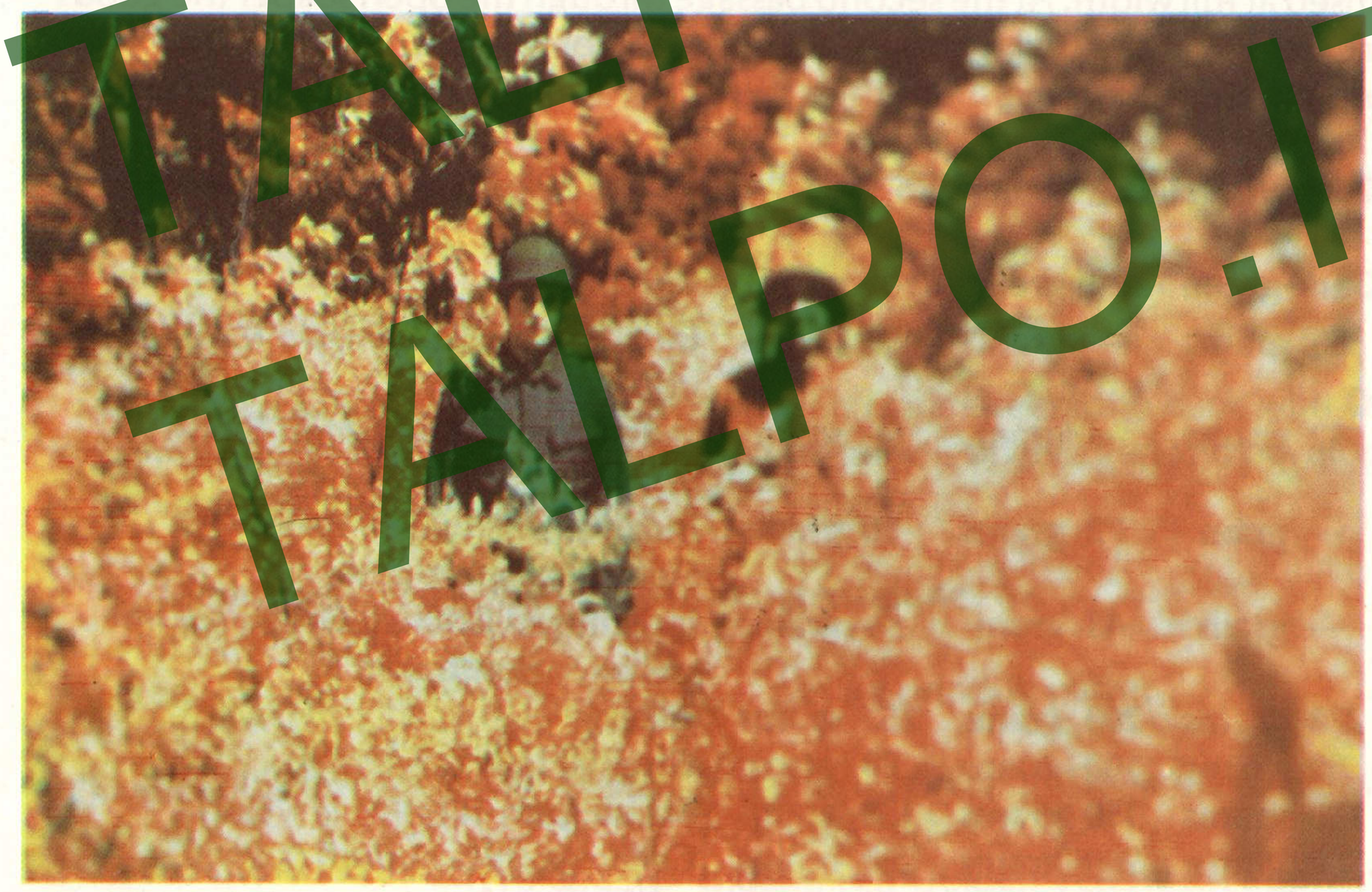
1942 Variant of Luftwaffe Pattern



1945 New Lieber Pattern.
Selected for all units.



1944 Late Pattern. Not Adopted



This infra-red photograph shows the effect of incorporating carbon into the camouflaged uniform material. *Left*: figure without carbon; R*ight*: figure with 4% carbon.

The fabric, printed on both sides and dried is steamed for 3-5 minutes in a rapid ager or for 10-12 minutes on the star frame. The depth of colour of Anthrasol Golden Yellow IRK, Anthrasol Green IB and Anthrasol Brown IBR is considerably increased by previous ageing. The fabric is then developed on the full width machine.

Example:

1st trough (acid proof, of pitchpine, or lined with lead-plates):
20ccm of sulphuric acid 66°Bé
plus 2 grams of Anthrasol Salt NO) per litre
time of passage: 20-20 seconds) at 70°C

2nd and 3rd trough: spraying with cold water and rinsing.

4th trough: neutralizing with 2 grams of calcined soda per litre.

5th and 6th trough: rinsing.

During the night the developed fabric is immersed at full width in a desizing liquid containing Biolase N18 powder, or Viveral E extra and on the next day rinsed at full width. At the second passage through the open soaper the goods are treated at the boil with a brand of Igepon or Igepal and with soda, rinsed and then dried on the stenter.

FILM PRINTING, COLOURS CONTAINING INDANTHREN DYESTUFFS:

Dark-green	Leaf green	Brown ground	
60 grams	— gram	107 grams	Indanthren Black Brown R paste for printing
42 grams	— gram	— grams	Indanthren Olive Green B fine powder
— gram	72 grams	16 grams	Indanthren Golden Yellow RK Suprafix double paste
— gram	48 gram	— gram	Indanthrèn Brilliant Green 4G fine paste, concentrated
278 grams	200 grams	257 grams	water
80 grams	100 grams	80 grams	Glycinal HD
150 grams	150 grams	150 grams	British gum 1:1
200 grams	200 grams	200 grams	Cellapret thickening 1:7
40 grams	50 grams	40 grams	calcined soda
50 grams	60 grams	50 grams	potash
100 grams	120 grams	100 grams	Rongalit C
1kg	1kg	1kg	

Dark green	Yellow brown	Light brown ground	
130 grams	30 grams	83 grams	Indanthren Black Brown R paste for printing
15 grams	— gram	8 grams	Indanthren Olive Green B fine powder
20 gram	170 grams	8 grams	Indanthren Yellow Brown 3G Suprafix double paste
155 grams	170 grams	282 grams	water
100 grams	100 grams	80 grams	Glycinal HD
150 grams	100 grams	150 grams	British gum 1:1
200 grams	200 grams	200 grams	Cellapret thickening 1:7
50 grams	50 grams	40 grams	calcined soda
60 grams	60 grams	50 grams	potash
120 grams	120 grams	100 grams	Rongalit C
1kg	1kg	1kg	

The fabric, printed on both sides and dried, is steamed in the rapid ager or on the star frame for 6-10 minutes and developed on the open soaper.

Example:

1st trough: 3ccm of hydrogen peroxide of 30% strength) per
plus 5ccm of acetic acid of 30% strength (6°Bé)) litre

2nd trough: spraying with cold water and rinsing.

3rd and 5th trough: aftertreating with Igepal and soda at the boil.

6th trough: rinsing.

MIXED PRINTING BY MEANS OF ANTHRASOL AND INDANTHREN DYESTUFFS:

1. Anthrasol bottom print by means of film screens.

The face of the SS-awning is printed with Dark Green, the back with Dark Brown, as previously mentioned. Then the fabric is dried, aged and developed with sulphuric acid as usual.

2. Indanthren overprint on the printing machine.

Face:		per kg printing paste:
LEAF GREEN:	100 grams	Indanthren Brilliant Green 4G fine paste concentrated
	70 grams	Indanthren Golden Yellow RK Suprafix double paste
BROWN GROUND:	150 grams	Indanthren Black Brown B paste for printing
	20 grams	Indanthren Brilliant Orange RK Suprafix paste