CHART VII

APPEARANCE OF FILAMENTS AND COMPARATIVE SIZE. AS IS.

Microscope at 160 mm; 8 mm objective; 12 X Ocular; using the micrometer eye piece ocular for comparative size.

DuPont Xanthate; styrations quite plain; flat;	.6-.7
DuPont Acetate; like a glass rod; round;	.5-.6
Bemberg; no sign of styrations; round;	.2- .4
Celanese; twisted styrations; rounded flat;	.5- .6
Tubize; irregular styrations; some specks;	.3-.5
Viscose; styrations plain; flat;	.6-.7

CHART VIII

APPEARANCE OF YARNS AND COMPARATIVE SIZES. AS IS.

Set up as above with exception of 16 mm objective.

DuPont Acetate; slight twist; some specks;	.6-.8
Bemberg; some twist;	.7-.8
Celanese; little twist.	.6-.8
Tubize; some twist.	.6-.7
Viscose; quite noticable twist.	.6-.7
DuPont Xanthate; not as twisted as Viscose.	.6-.7

CHART IX

APPEARANCE A FTER DYEING WITH DIRECT DYE ON UNSCOURED.

SAME SET UP AS FOR CHART VIII.

DuPont Acetate; specks; considerable twist; no color; as compared with other; stain	.6-.7
Bemberg; dyed deeply.	.6-.8
Celanese; few specks; opened up, stained.	.6-.8
Tubize; fairly deep dyed; some specks.	.5-.7
Viscose; deeply dyed.	.6-.7
DuPont Xanthate; deeply dyed.	.6-.7

NOTE: twist in all as in previous tests.

CHART X

APPEARANCE AFTER DYEING WITH DIRECT DYE ON SCOURED.

SET UP AS FOR CHART IX.

DuPont Acetate; specked; stained not dyed.	.6-.7
Bemberg; displaced filaments; deeply dyed.	.4-.8
Celanese; opened up, stained not dyed.	.6-.8
Tubize; fairly deep dyeing, some specks.	.5-.7
Viscose; specks; deep color.	.6-.8
DuPont Xanthate; deep color.	.5-.8

CHART XI

APPEARANCE OF FILAMENTS AFTER TREATMENT. REFLECTED LIGHT.

8 mm objective; 12 X Ocular; micrometer disc.

DUPONT ACETATE.

As is; wide deep styrations. .5-.6

Direct dye, blue, unscoured; stained not dyed; few bubbles; wide deep styrations. .5-.6

Direct blue dye, scoured; stained not dyed; many bubbles; wide deep styrations. .5-.6

Direct red dye; rough; bubbles. .5-.6

Soap 1 to 100 at 140 F. Bubbles, wide deep styrations; .5- .6

Soap 1 to 100 at 180 F. As at 140 F.

Soap 1 to 100 at a boil. Bubbles; dull. .5- .6

Soap 1 to 1000 at 190 F. Bubbles, rough, dull .5-.6

NaCl 1 to 1000 at 190 F. Rough and bubbles. .5-.6

Na2SO4 1 to 1000 at 190 F. Rough, bubbles, few adhering particles. .5-.6

Na2CO3 1 to 1000; at 190 F; Rough, bubbles. .5-.6

Basic blue dye; scoured; deep color; bubbles, deep styrations. .5-.6

Basic blue dye; unscoured; as scoured.

Basic red dyed. Slight red color, bubbles. .5-.6

Vat blue dye, scoured; deep styrations; eroded places. stained not dyed. .5-.6

Vat blue dye, unscoured. Rough, pock marks, bubbles, deep irregular styrations. .5-.6

CHART XI contnued.

Vat red dye. Slight irregular dyeing. Styrations. .5-.6

SRA blue dye, scoured. Deep color. some bubbles. .5-.6

SRA blue dye, unscoured. Deep color, some bubbles. .5-.6

SRA red. Deep styrations. Deep color. .5-.6

Acid blue dye. Looks eaten away. Rough. Stained. .5-.6

Acid red dye. Stained. Rough. .5-.6

CHART XII

APPEARANCE OF FILAMENTS ATER TREATMENT. REFLECTED LIGHT. 8 mm objective. 12 X Ocular . Micrometer ocular disc.

BEMBERG

As is; smooth round. .2

Direct dye blue, unscoured; weak blue, smooth, few bubbles. .2

Direct blue dye, scoured; as unscoured. .2

Direct red dye; smooth round. Medium deep color. .2

Soap 1 to 100 at 140 F. Smooth round. .2

Soap 1 to 100 at 180 F. Smooth round. .2

Soap 1 to 100 at a boil. Smooth round. .2

Soap 1 to 1000 at 190 F. Smooth round. .2

NaCl 1 to 1000 at 190 F. Smooth round. .2

Na_2SO_4 1 to 1000 at 190 F. Smooth round. .2

Na_2CO_3 1 to 1000 at 190 F. Smooth round. .2

Basic blue dye, scoured; dyed well, very few bubbles. .2

Basic blue dye, unscoured. As scoured.

Basic reddye. Dyed medium; few adhering particles. .2

Vat blue dye, scoured; smooth. .2

Vat blue dye, unscoured; as scoured. .2

Vat red dye. Medium red, some bubbles. .2

SRA blue dye, scoured. Colorless, smooth. .2

SRA blue dye, unscoured. As scoured. .2

SRA red dye; colorless, occassional bubbles. .2

Acid blue dye; slightly rough, little stain. .2

Acid red dye; few adhering particles, stained. .2

CHART XIII

APPEARANCE OF FILAMENTS AFTER TREATMENT. REFLECTED LIGHT.

8 mm objective. 12 X ocular. Micrometer ocular disc.

CELANESE

As is; deep wide styrations, bubbles. .5-.6

Direct blue dye, unscoured; wavy styrations, slight stain .5-.6

Direct blue dye; scoured; few small bubbles, slight stain .5-.6

Direct red dye; dullness of lustre, slight stain. .5-.6

Soap 1 to 100 at 140 F; very small bubbles. .5-.6

Soap 1 to 100 at 180 F; bubbles and deep styrations; .5-.6

Soap 1 to 100 at a boil; small bubbles, twisted styrations, dull. .5-.6

Soap 1 to 1000 at 190 F; small bubbles, deep styrations .5-.6

NaCl 1 to 1000 at 190 F; twisted styrations, many small bubbles. .5-.6

Na_2SO_4 1 to 1000 at 190 F; twisted styrations, small bubbles, few adhering particles. .5-.6

Na_2CO_3 1 to 1000 at 190 F; dull, some adhering particles, small bubbles. .5-.6

Basic blue dye, scoured; medium color, deep styrations. .5-.6

Basic blue dye, unscoured; as scoured. .5-.6

CHART XLII continued.

APPEARANCE OF FILAMENTS AFTER TREATMENT. REFLECTED LIGHT.

8 mm objective. 12X objective. Micrometer ocular disc.

CELANESE

Basic red dye. Slight color, deep styrations. .5-.6

Vat blue dye, scoured; slight stain, bubbles, deep styrations. .5-.6

Vat blue dye, unscoured; as scoured, and few rough places .5-.6

Vat red dye. Med color, rough places, deep styrations. .5-.6

SRA blue dye, scoured; deep color, few bubbles. .5-.6

SRA blue dye, unscoured; some bubbles. .5-.6

SRA red dye; medium color, deep styrations, few bubbles .5;.6

Acid blue dye; very rough, some adhering particles, sligh stain. .5-.6

Acid red dye; some stain, some bubbles. .5-.6

CHART XIV

APPEARANCE OF FILAMENTS AFTER TREATMENT. REFLECTED LIGHT.

8mmobjective. 12 X Ocular. Micrometer ocular disc.

TUBIZE

As is. Few bubbles, deep wide styrations. .4-.6

Direct blue dye, unscoured. Little color, deep wide styrations. .4-.6

Direct blue dye, scoured. As unscoured. .4-.5

Direct red dye. Little color, few bubbles, deep wide styrations. .4-.5

Soap 1 to 100 at 140 F. Some bubbles, some rough places .5

Soap 1 to 100 at 180 F. Few rough places, some bubbles. .4-.5

Soap 1 to 100 at a boil. Deep wide styrations, some bubbles. .4-.5

Soap 1 to 1000 at 190 F. Deep wide styrations, few nicked places. .5

NaCl 1 to 1000 at 190 F. Very wide styrations, few bubbles. .5

Na_2SO_4 1 to 1000 at 190 F. Few adhering particles, few bubbles, deep wide styrations. .5

Na_2CO_3 1 to 1000 at 190 F. Few adhering particles, some bubbles, deep styrations. .4- .5

Basic blue dye, scoured. Deep color, deep styrations, few bubbles. .4-.5

Basic blue dye, unscoured. As scoured.

CHART XIV continued.

TUBIZE.

Basic red dye. Some color, narrow styrations. .4-.5

Vat blue dye, scoured. Deep color, regular styrations, few bubbles. .4-.5

Vat blue dye, unscoured. Some roughness, deep color, regular styrations. .4-.5

Vat red dye. Slight color, deep styrations, some bubbles. .4 -.5

SRA blue dye, scoured. No color, regular styrations, few bubbles. .4-.5

SRA blue dye, unscoured. No color, regular styrations, few rough places. .4-.5

SRA red dye. Ver little color, few rough places, deep styrations. .4- .5

Acid blue dye. Very little color, few bubbles, deep styrations. .4-.5

Acid red dye. Medium color, few rough places, spme adhering matter. .4 -.5

CHART XV

APPEARANCE OF FILAMENTS AFTER TREATMENT. REFLECTED LIGHT.

8 mm objective. 12 X Ocular. Micrometer ocular disc.

VISCOSE

As is. Distinct styrations. .5-- .65

Direct blue dye, unscoured. Deep blue. .5- .6

Direct blue dye, scoured. Deep blue, very slight twist in some filamnets. .5- .6

Direct red dye. Medium color, straight styrations, few bubbles. .5-.6

Soap 1 to 100 at 140 F. Very distiont styrations. .5-.6

Soap 1 to 100 at 180 F. Styrations wavy. .5-.6

Soap 1 to 100 at a boil. At certain planes, bubbles of very small size appear on the surface of the filaments. .5- .6

Soap 1 to 1000 at 190 F. Occassional bubbles. .5-.6

NaCl 1 to 1000 at 190 F. Distinct styrations. .5-.6

Na_2SO_4 1 to 1000 at 190 F. Occassional bubbles, styrations distinct, wavy. .45-.6

Na_2CO_3 1 to 1000 at 190 F. Occasional bubbles, straight styrations. .5-.6

Basic blue dye, scoured. Deep color, few bubbles. .5-.6

Basic blue dye, unscoured. Deep color, distiont styrations. .5- .6

Basic red dye. Weak color, some bubbles, styrations distinct. .5-.6

Vat blue dye. Weak color, wavy styrations, few bubbles .5-.6

CHART XV continued.

VISCOSE

Vat blue dye, unscoured. Weak color, styrations distinct. .5-.6

Vat red dye. Weak color, distinct styrations, few slight twists. mostly .6

SRA blue dye, scoured. Colorless, distinct styrations. .5-.6

SRA blue dye, unscoured. Colorless, distinct styrations. .5-.6

SRA red dye. Colorless, distinct styrations. .5-.6

Acid blue dye. Very little color, distinct styrations, slight waves. .5-.6

Acid red dye. Slight color, few bubbles, distinct styrations.

CHART XVI

APPEARANCE OF FILAMENTS AFTER TREATMENT. REFLECTED LIGHT

8 mm objective. 12 X Ocular. Micrometer ocular disc.

DUPONT XANTHATE.

As is. Distinct styrations. .5- .7

Direct blue dye, scoured. Some bubbles, very transparent, distinct styrations. Dyed. .6

Direct blue dye, unscoured. Weak color, distinct styrations, few adhering aprticles. .7

Direct red dye. Weak color, distinct styrations. .6-.75

Soap 1 to 100 at 140 F. Very transparent, distinct styrations, some bubbles. .6

Soap 1 to 100 at 180 F. Transparent, distinct styrations. .6

Soap 1 to 100 at a boil. Distinct styrations, some bubble .5

Water at aboil. Distinct styrations, few bubbles..6-.7

Soap 1 to 1000 at 190 F. Some bubbles, straight styrations. .6-.7

NaCl 1 to 1000 at 190 F.Straight styrations, few bubbles. .6-.7

Na2SO4 1 to 1000 at 190 F. Straight styrations, few bubbles. .6-.7

Na2CO3 1 to 1000 at 190 F. Distinct styrations. .6-.7

Basic blue dye, scoured. Strong color. Distinct styrations. .6-.7

Basic blue dye, unscoured. As scoured.

CHART XVI continued

DUPONT XANTHATE.

Basic red dye. Weak color, slight twist, distinct styrations. .6-.7

Vat blue dye, scoured. Weak color. Distinct styrations. .55-.7

Vat blue dye, unscoured. Weak color, distinct styrations, few bubbles. .6-.7

Vat red dye. Straight and distinct styrations, color weak. .6-.7

SRA blue dye, scoured. Colorless, distinct styrations. .6-.7

SRA blue dye, unscoured. Colorless, few bubbles, distinct styrations. .6 -.7

SRA red dye. Colorless, distinct styrations, few bubbles. .6-.7

Acid blue dye. Slight color, very distinct styrations. .55-.7

Acid red dye. Color weak, distinct styrations. .6-.7

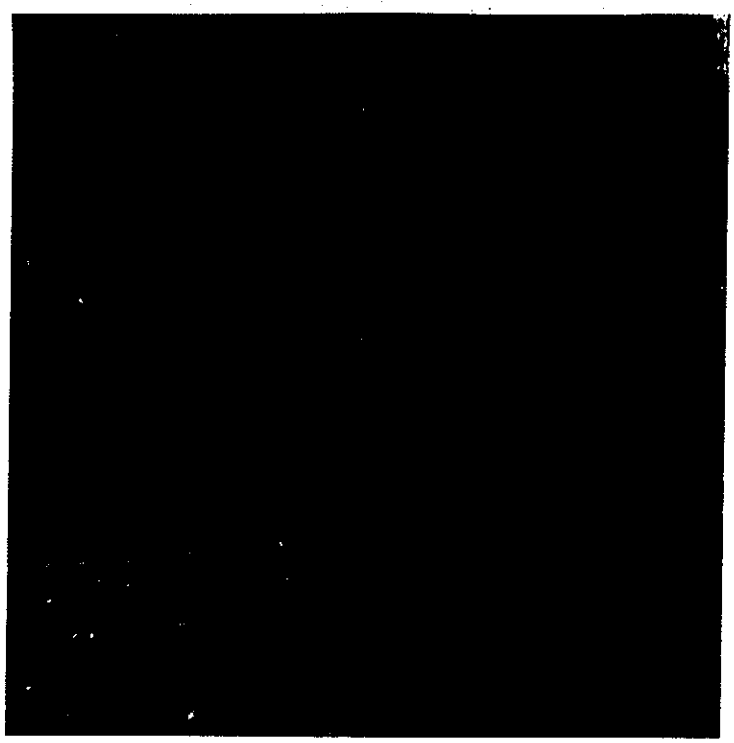
In photomicrography, the lack of an apochromatic objective was of course felt much more than in the mere viewing through the microscope. However, an attempt was made to take some photos to try to show some of the peculiarities of the yarn, filaments and cross-sections.

It was found that some of the yarns would appear better with the Silverman Illuminator than without it; in other cases, much better pictures could be taken by using the strong light passing through the bull's eye condenser from the back of the object. Many failures were made, but each failure taught something; mainly that that particular way was not to be used again.

Pages 114 to 179 inclusive have photomicrographs of the six types of rayon or artificial silk; each group being represented in yarn, filament and cross-section. Especially with Bemberg, the photographing was easy as compared with the other types, therefore, more Bemberg is shown.

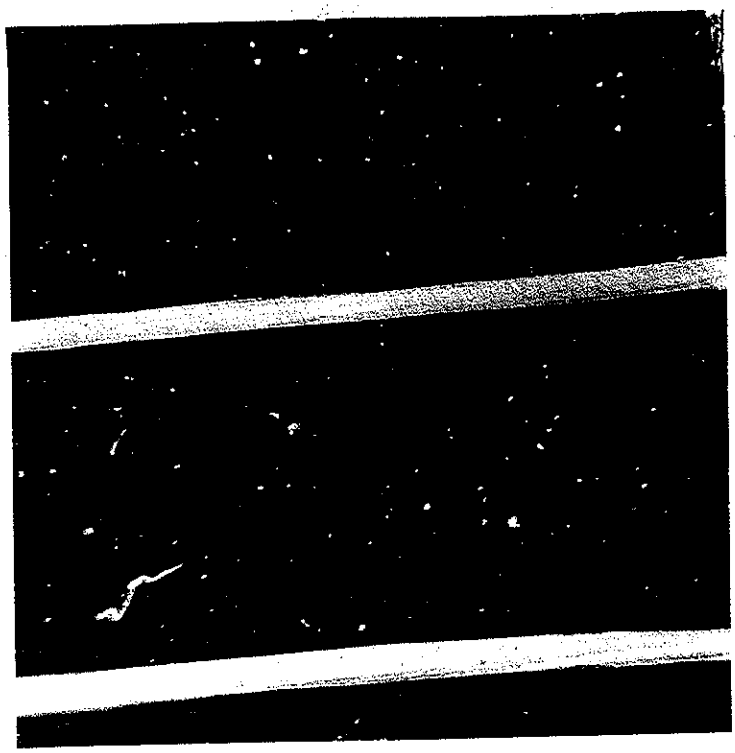
It was not possible to get good photomicrographs with many of the brass block cross-sections, so only a few of these are shown. However, those which are shown are good examples of what is seen when viewed with the microscope.

The reading matter below each picture tells what was being taken and also something about the set-up. In most cases, the camera extension was at 35 cm for the back of the camera.



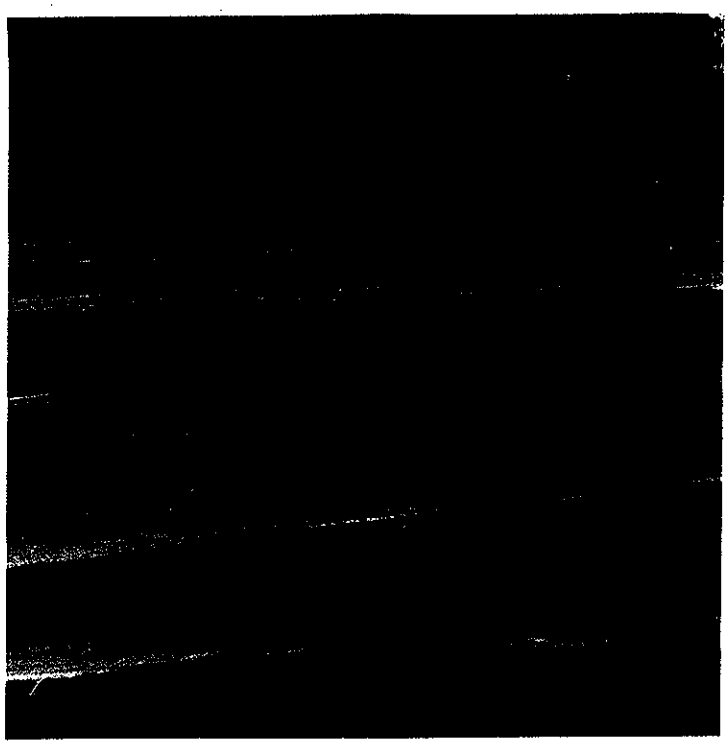
DUPONT ACETATE YARN. [illegible] SILVERMAN ILLUMINATOR

48 mm objective.



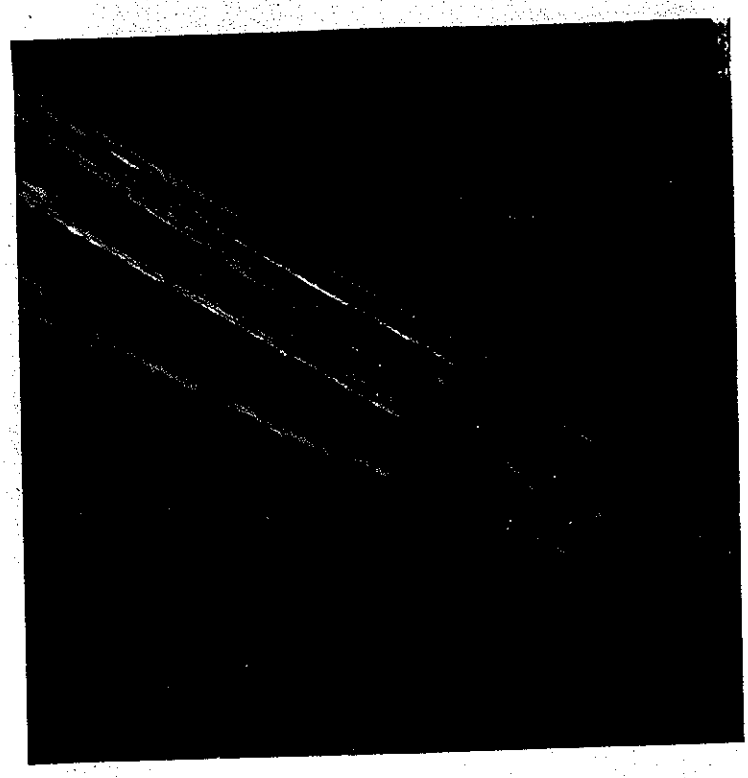
DUPONT ACETATE YARN AS IS. SILVERMAN ILLUMINATOR

48 mm objective.



DUPONT ACETATE YARN - DIRECT DYE. SILVERMAN ILLUMINATOR

48 mm objective.

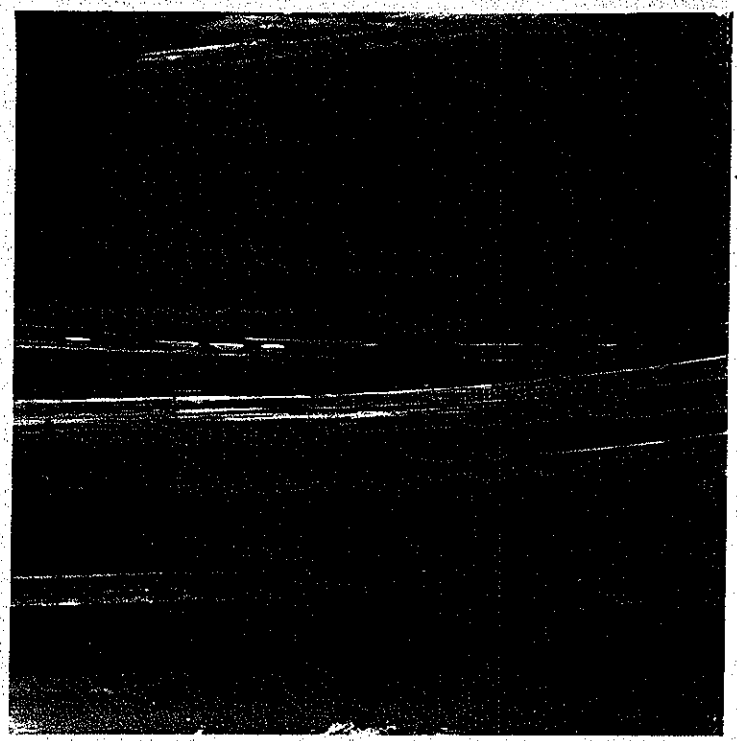


DUPONT ACETATE FILAMENTS. VAT BLUE. SILVERMAN ILLUMINATO

16 mm objective.

DUPONT ACETATE FILAMENTS. AS IS. SILVERMAN ILLUMINATOR.

16 mmobjective.



DUPONT ACETATE FILAMENTS. AS IS. SILVERMAN ILLUMINATOR.

16 mm objective

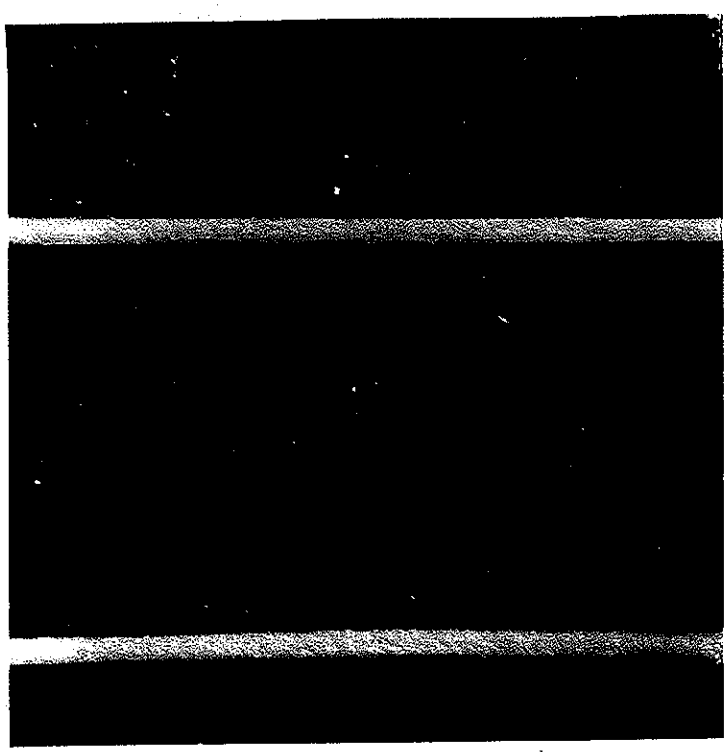
DUPONT ACETATE FILAMENTS. 194 X. Transmitted light.

DUPONT ACETATE X-SECTION. BASIC DYE. DIRECT LIGHT.

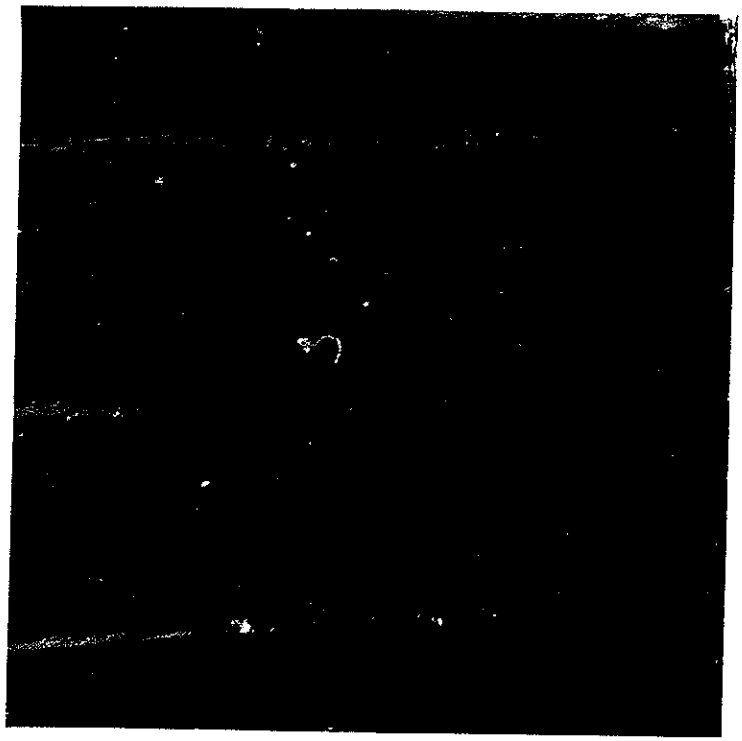
4 mm objective.

DUPONT ACETATE X-SECTION. SRA DYE. DIRECT LIGHT.

4 mm objective.

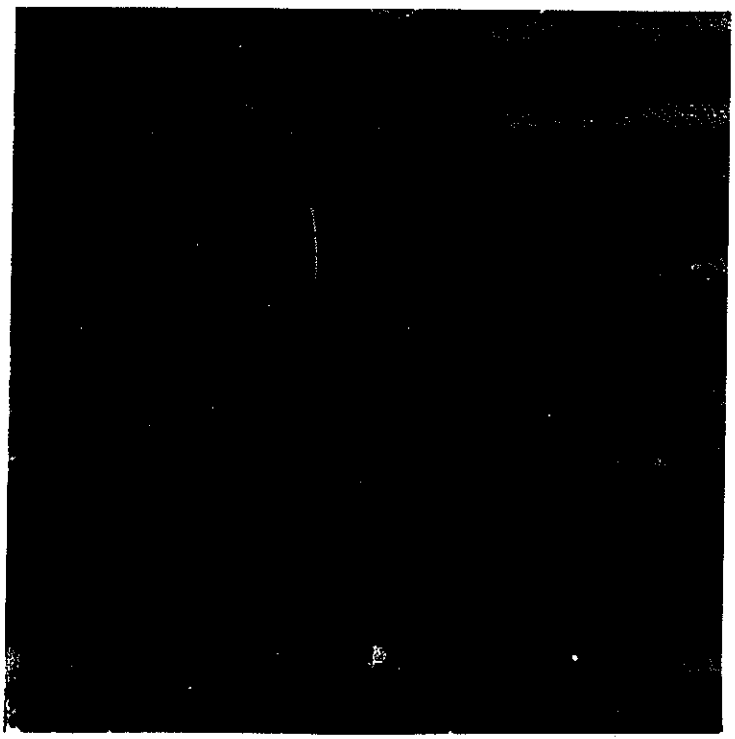


BEMBERG YARN AS IS. 48 mm objective. SILVERMAN ILLUMINATO



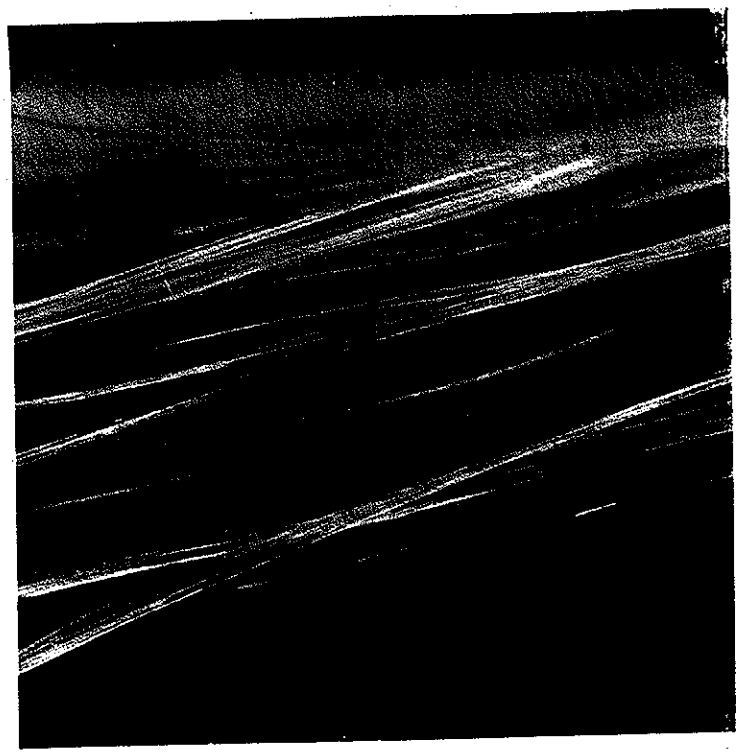
BEMBERG YARN. DIRECT DYE. SILVERMAN ILLUMINATOR

48 mm objective



REMBERG YARN. SRA DYE. SILVERLA' ILLUMINATOR

48 mm objective

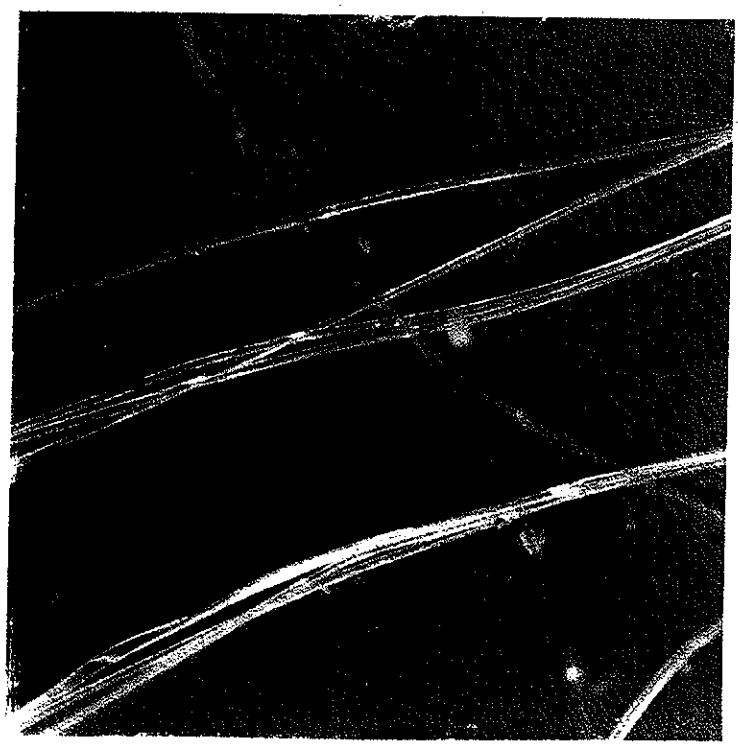


BEMBERG FILAMENTS. VAT DYE. SILVERMAN ILLUMINATOR.

16 mm objective.

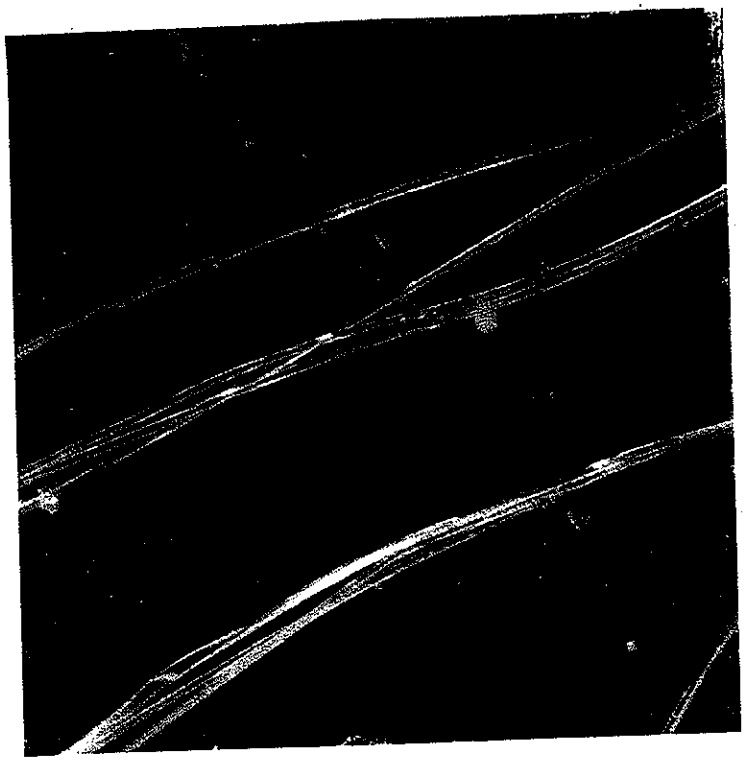
BEMBERG FILAMENTS. BASIC DYE. SILVERMAN ILLUMINATOR.

16 mm objective.

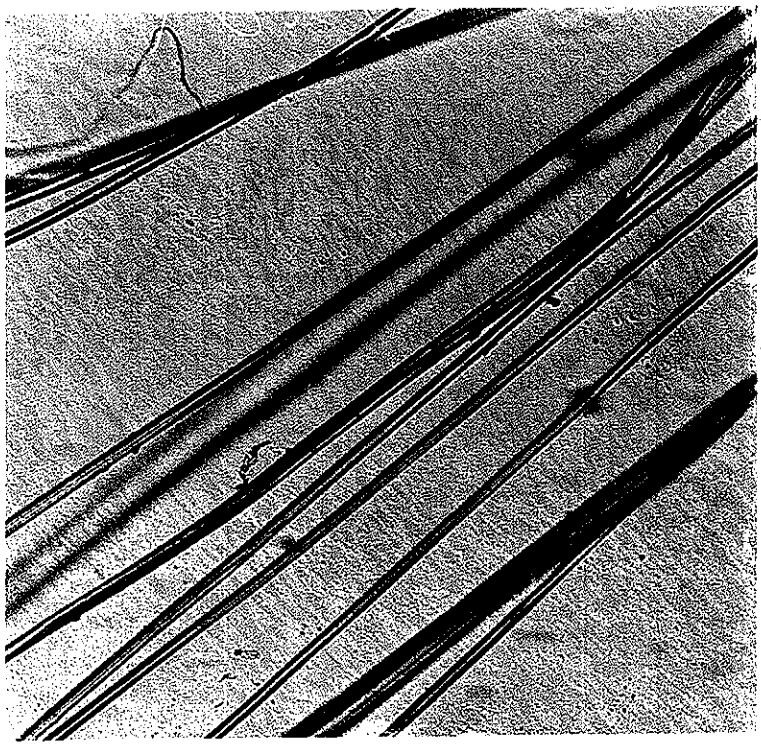


BEIBERG FILAMENTS. AS IS. SILVERMAN ILLUMINATOR.

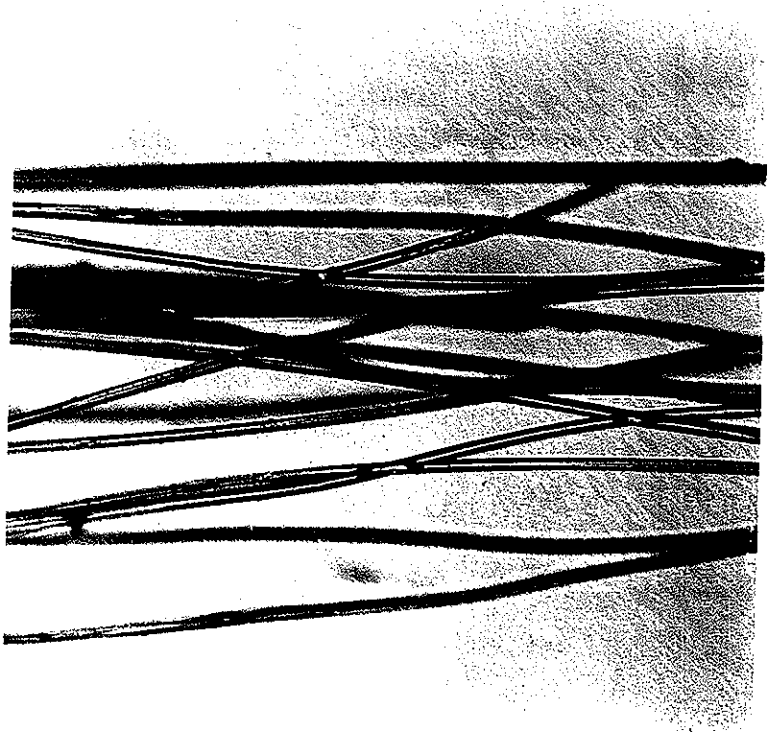
16 mm objective.



PEMBERG FILAMENTS, AS IS. 1/6 mm Objective. USING THE SILVERMAN ILLUMINATOR.



EMBERS PLANTS. 194 X. Transmitted light.



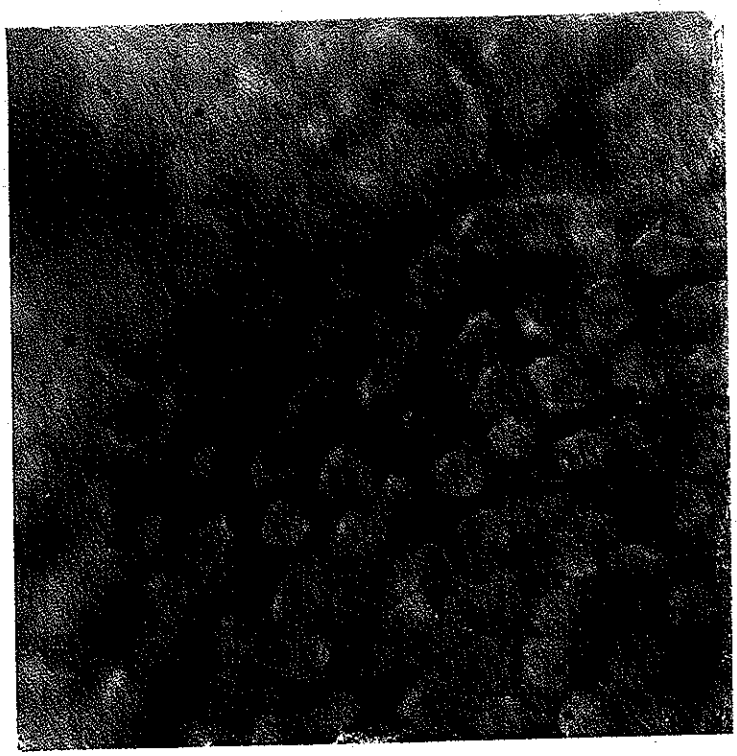
PETTERS FILAMENTS AS IN 194 X, Transmitted light.

BERBERG X-SECTION. AS IS. DIRECT LIGHT.

4 mm objective,

BEMBERG X-SECTION. SRA DYE. DIRECT LIGHT.

4 mm objective.



BEIBERG X-SECTION. VAT DYE. DIRECT LIGHT.

4 mm objective

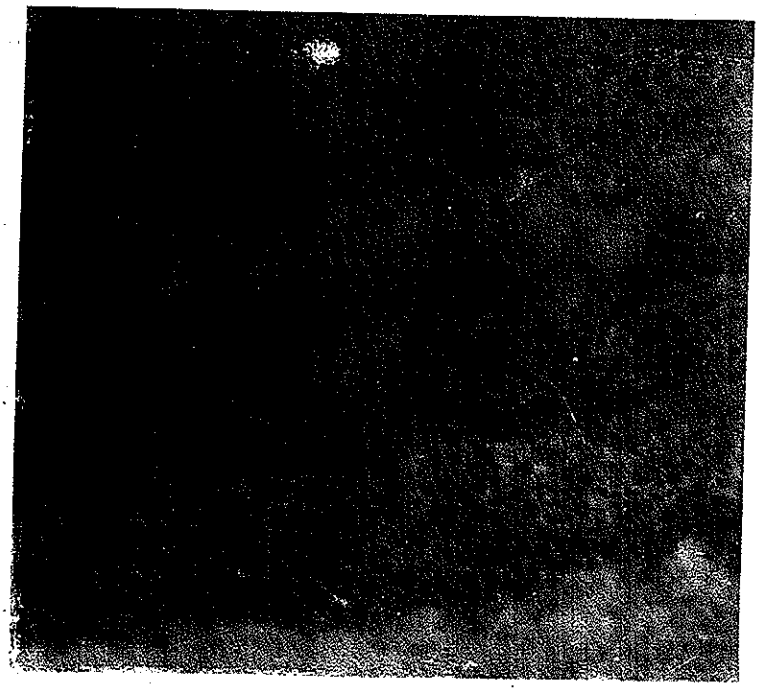
FIELBERG X-SECTION. BASIC DYE. LIGHT DIRECT.

4 mm objective.

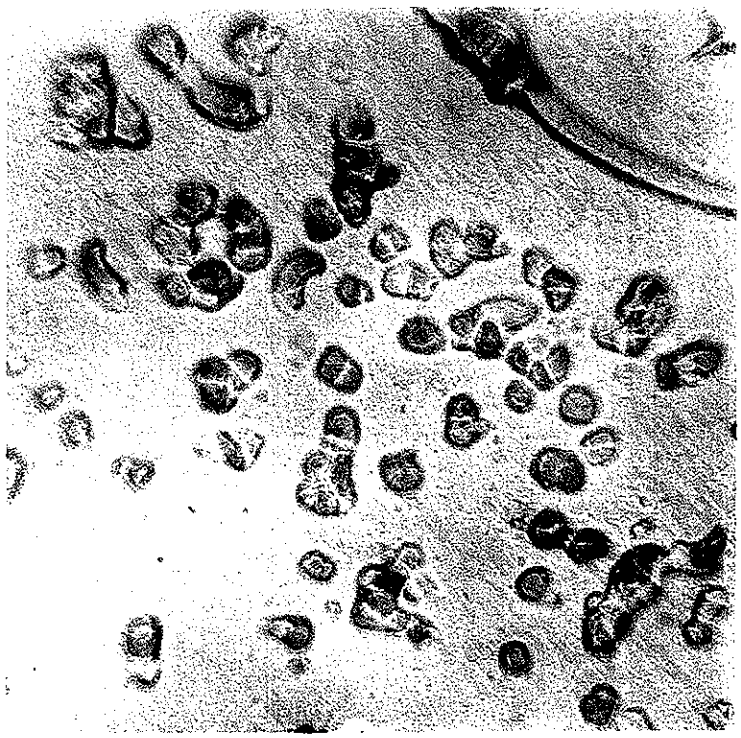
ELECTRO X-STATIC IMPRINT, AS IS, USING THE VERTICAL ILLUMINATOR HAVING AN ELECTRIC LIGHT ATTACHMENT.

ENTERO X-SECTION IN PARAFFIN, SET # 11, DIRECT DYE.

Direct light. 8 mm Objective.

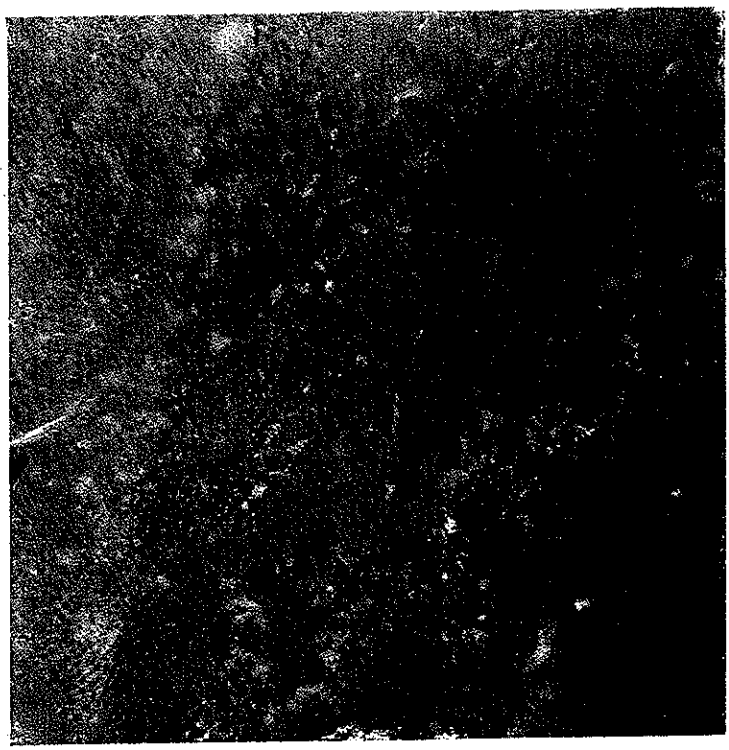


[illegible] X-SECTION IN BRASS, AS IS. 2 mm Objective. USING SILVERMAN ILLUMINATOR

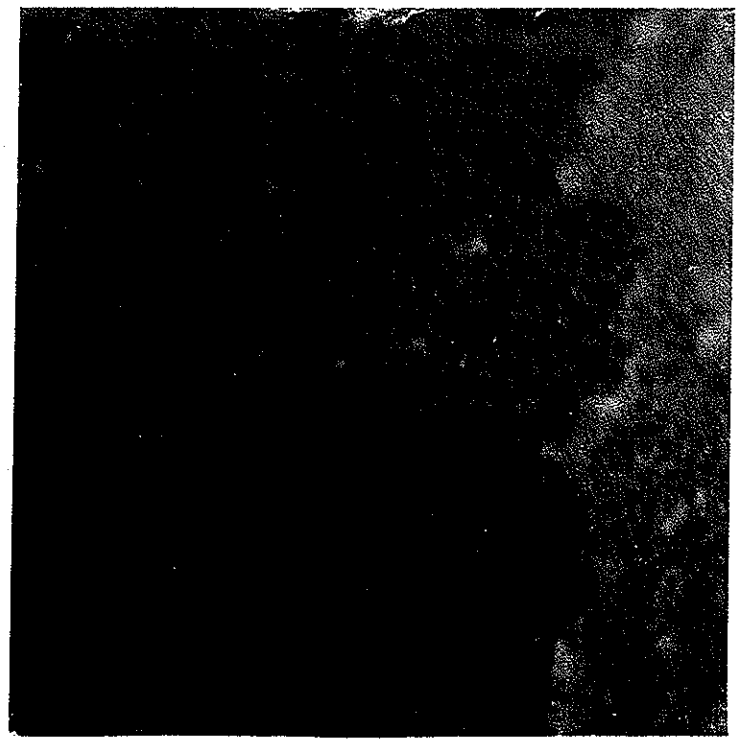


[illegible] X-SECTION [illegible]. AC IS. 8 mm Objective.

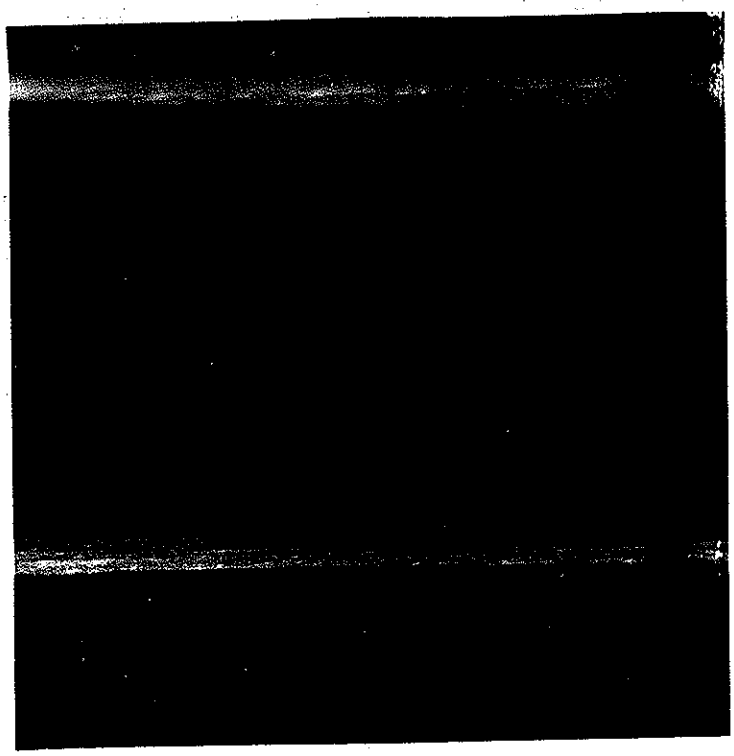
Direct light.



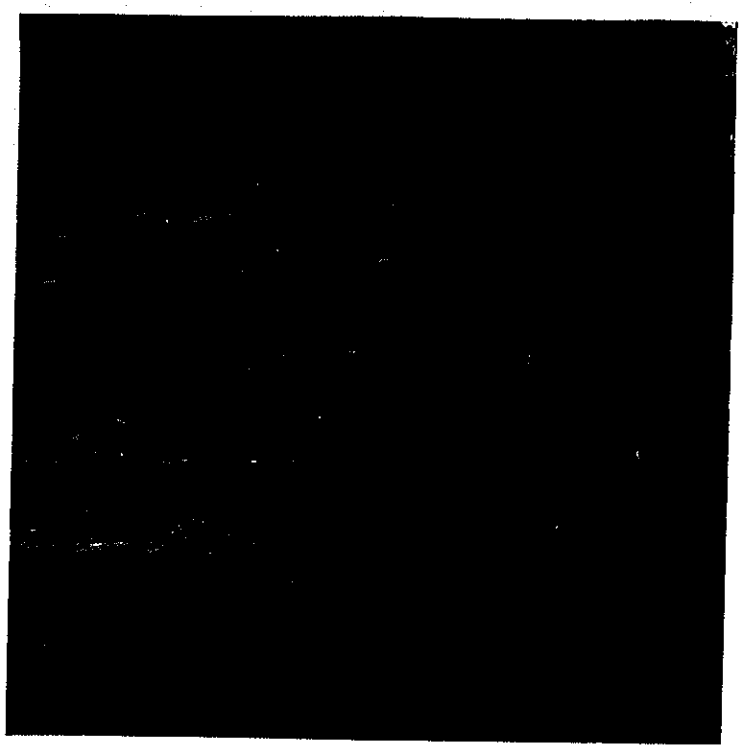
PERITIC,MOUNTED IN BRASS. MAGNIFICATION, AS IS. USING THE
[illegible] ILLUMINATOR.



PEARLITIC X-SECTION IN BRASS. 2 mm Objective, USING THE SILVERMAN ILLUMINATOR.

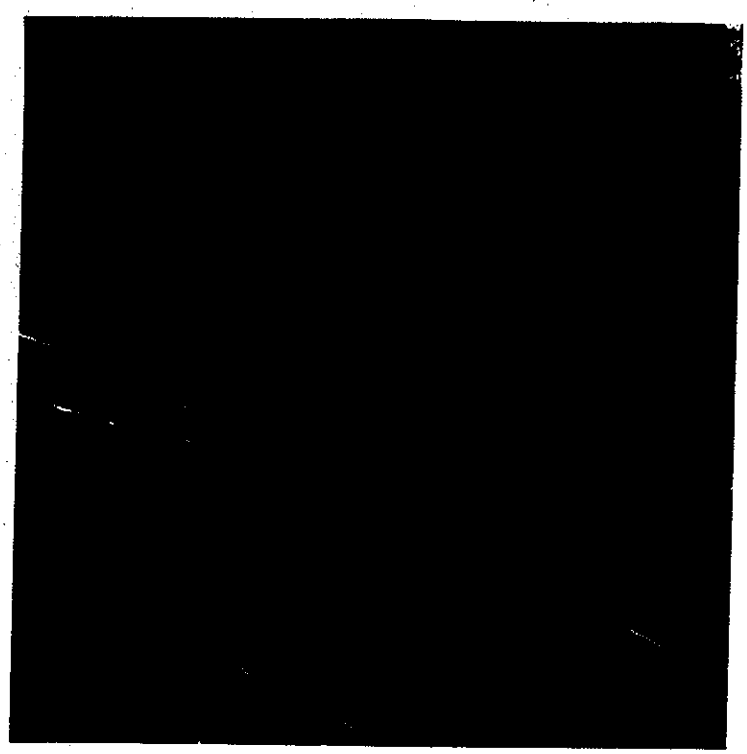


CELANESE YARN AS IS. 48 mm objective. SILVERMAN ILLUMINAT



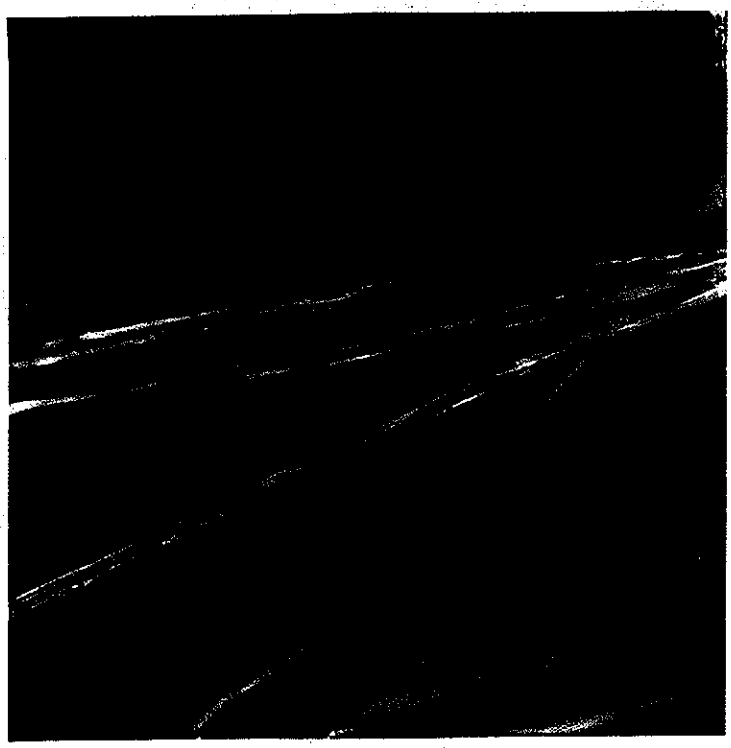
CELANESE YARN. DIRECT DYE. SILVERMAN ILLUMINATOR.

48 mm objective.



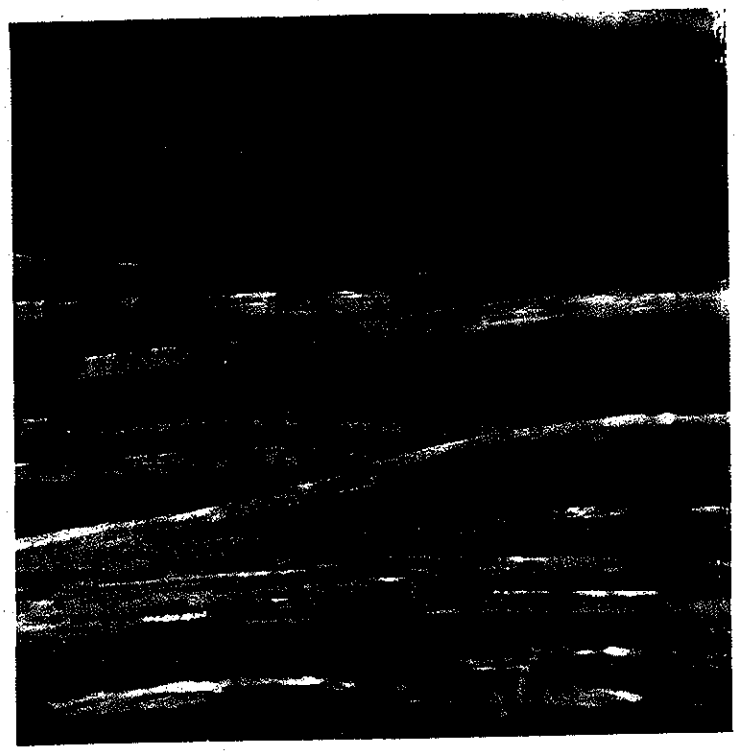
CELANESE FILAMENTS. VAT DYE. SILVERMAN ILLUMINATOR

16 mm objective



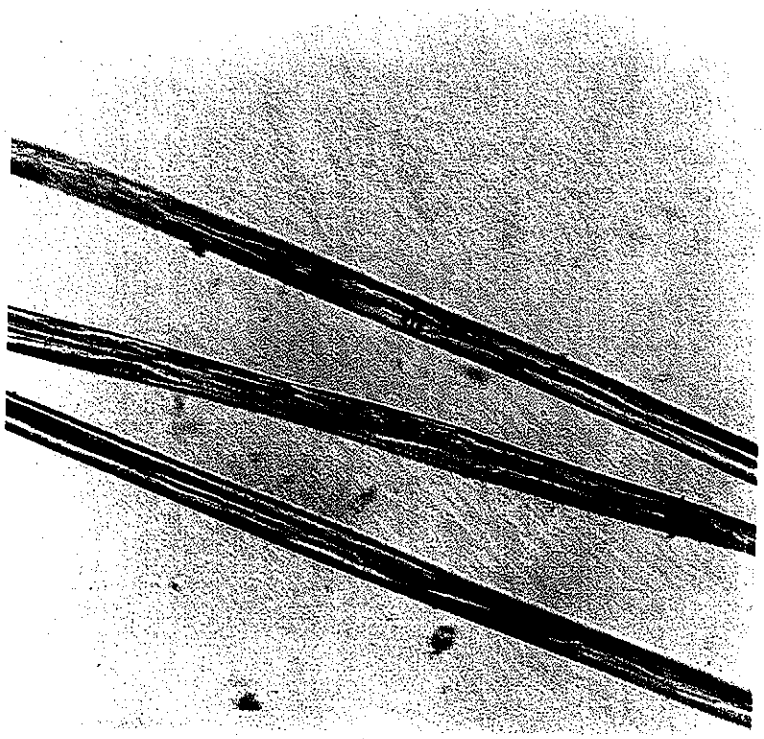
CELANESE FILAMENTS. BASIC DYE. SILVERMAN ILLUMINATOR.

16 mm objective.

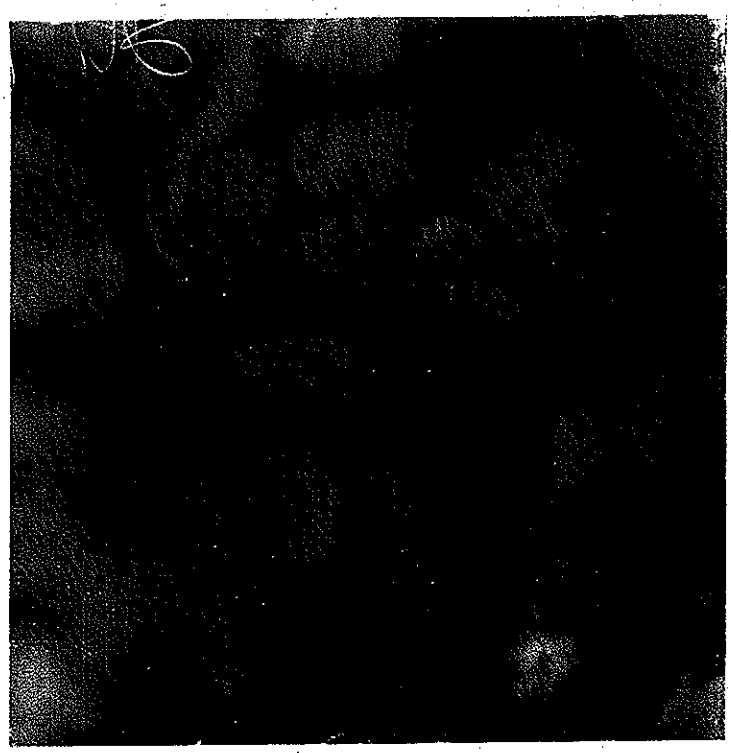


CELANESE FILAMENTS. AS IS. SILVERMAN ILLUMINATOR.

16 mm objective.

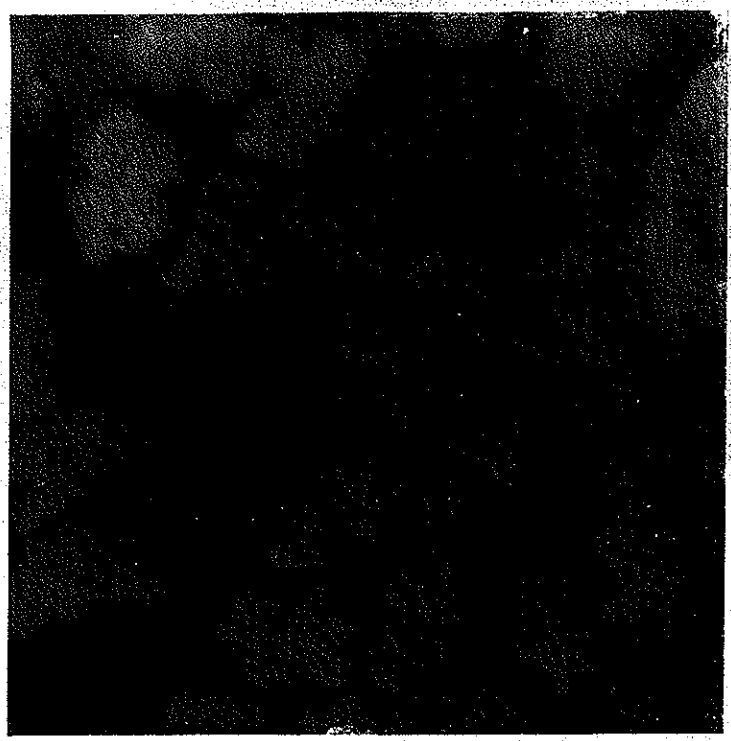


CELTESE FILAMENTS AS IS 194 X. Transmitted light.



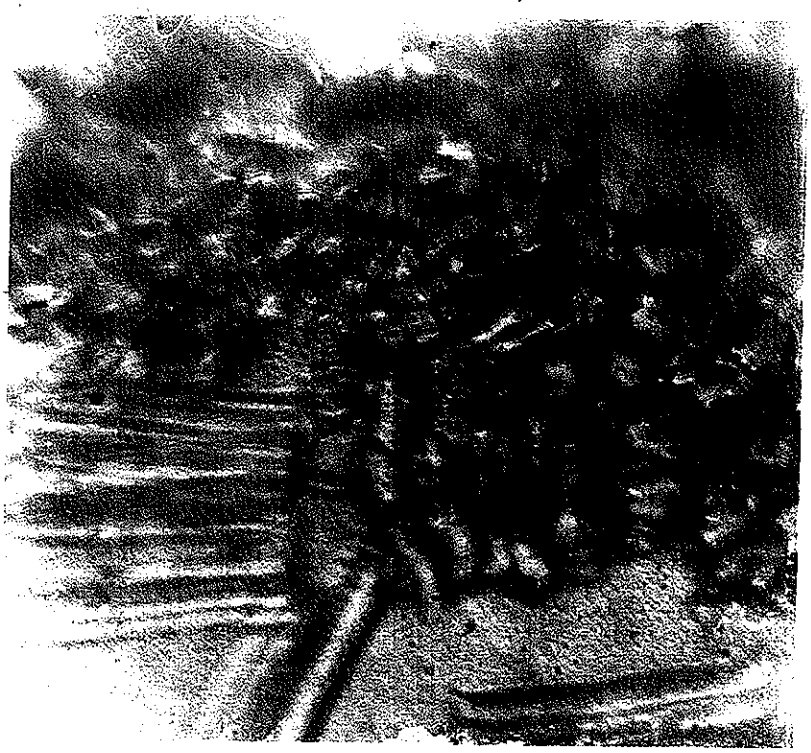
CELANESE X-SECTION. DIRECT DYE. DIRECT LIGHT.

4 mm objective.



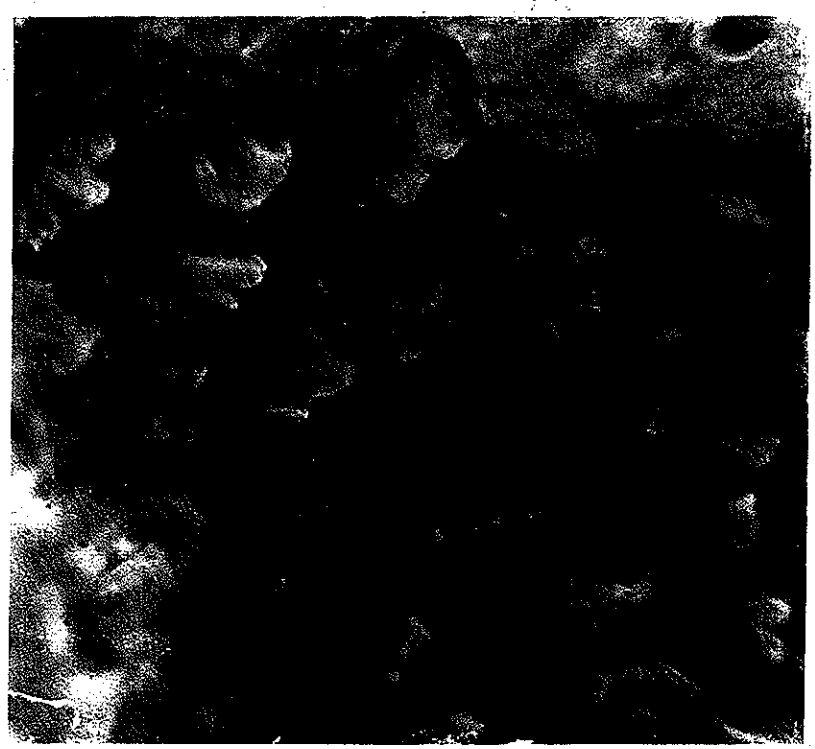
CELANESE X-SECTION. VAT DYE. DIRECT LIGHT.

4 mm objective.



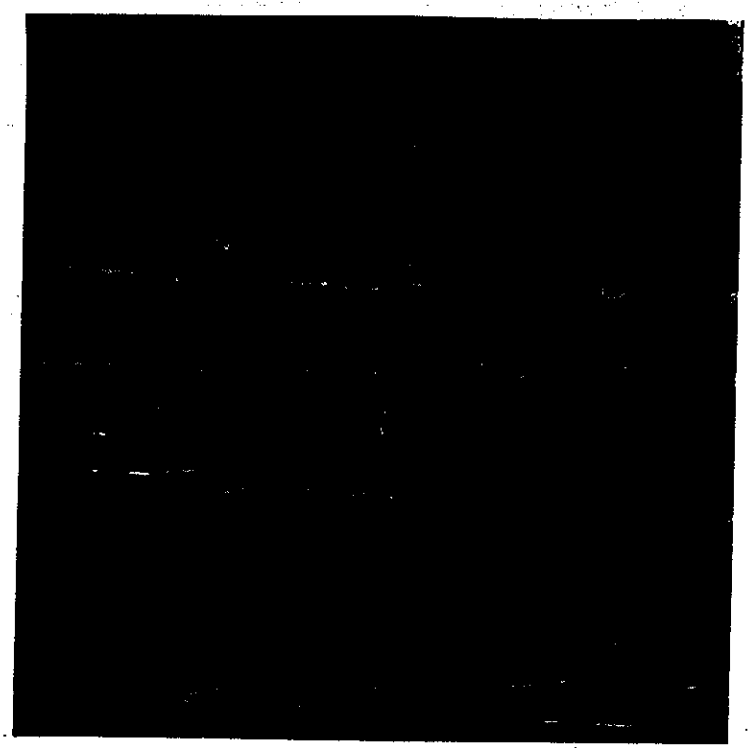
CTL.ERSE X-SECTION IN PARAFFIN. SET # 18. S.R.A. DYES.

Direct light. 8 mmobjective.



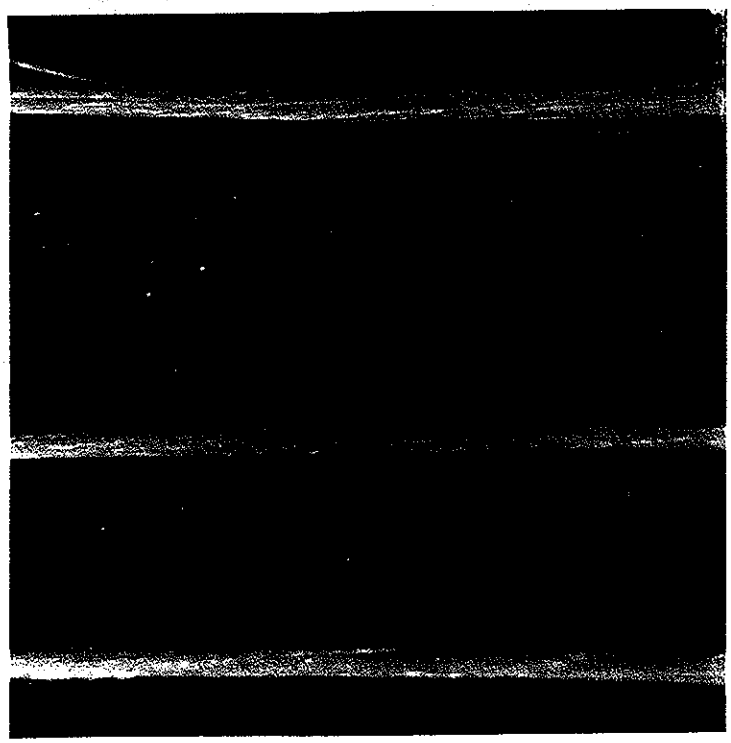
CELANESE X-SECTION IN PARAFFIN. SET # 18. S.R.A.BLUE.

Direct light. 4 mm Objective.



TUBIZE YARN. DIRECT DYE. SILVERMAN ILLUMINATOR

48 mmobjective.

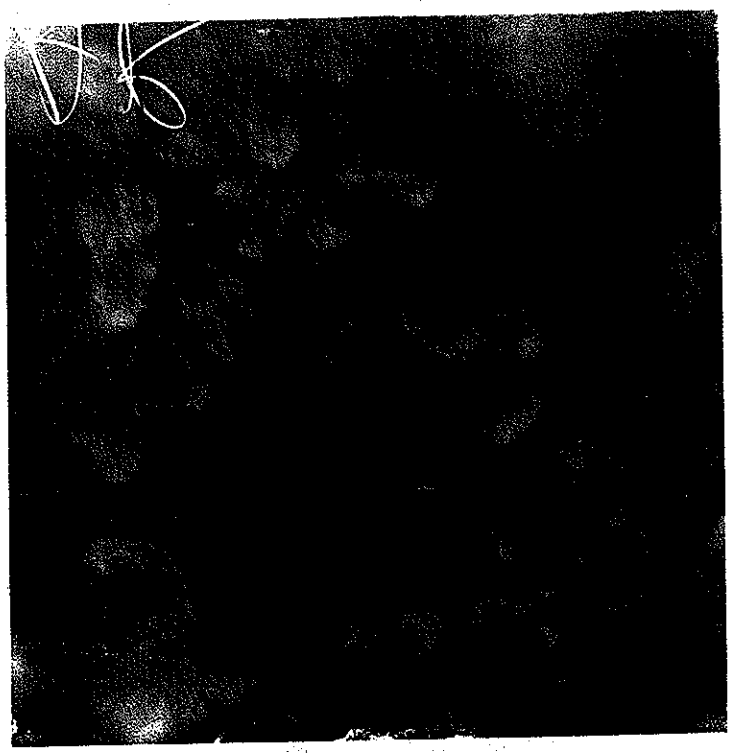


TUBIZE YARN as is. 48 mm objective. SILVERMAN ILLUMINATOR

TUBIZE FILAMENTS. AS IS. SILVERMAN ILLUMINATOR.

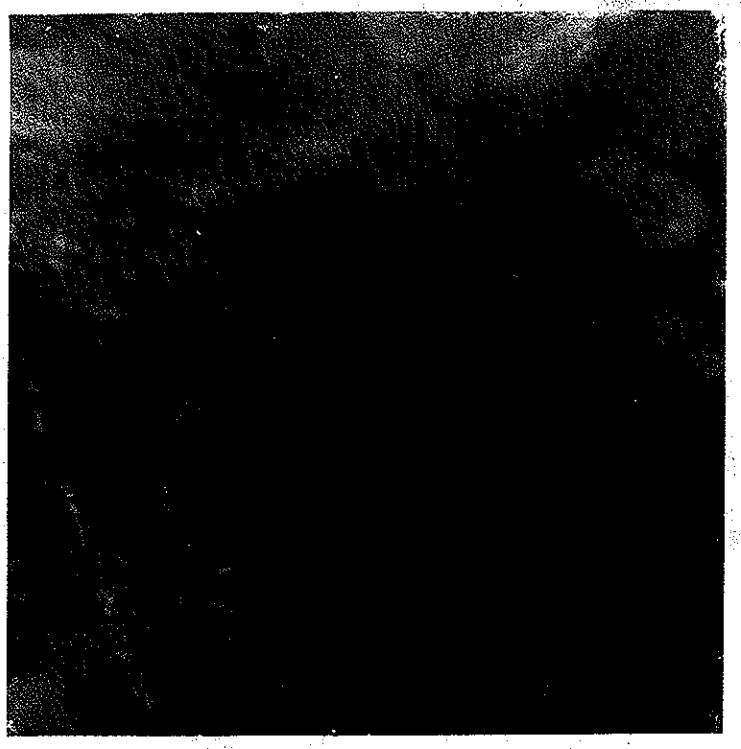
16 mm objective.

TUBIZE FILAMENTS. AS IS. 194 X. Transmitted light.



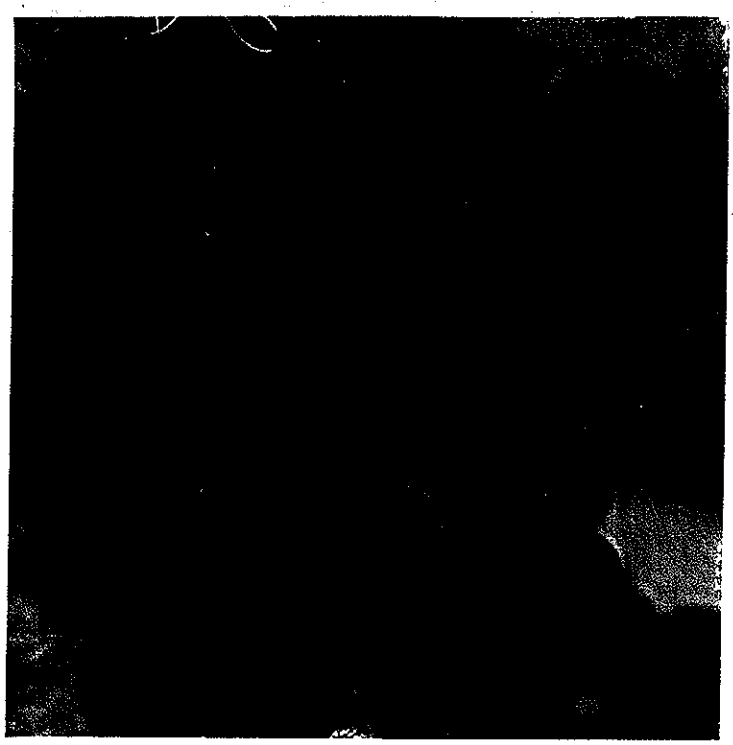
TUBIZE X-SECTION. SRA DYE. DIRECT LIGHT

4 mm objective.



TUBIZE X SECTION. AS IS. DIRECT LIGHT.

4 mm objective.

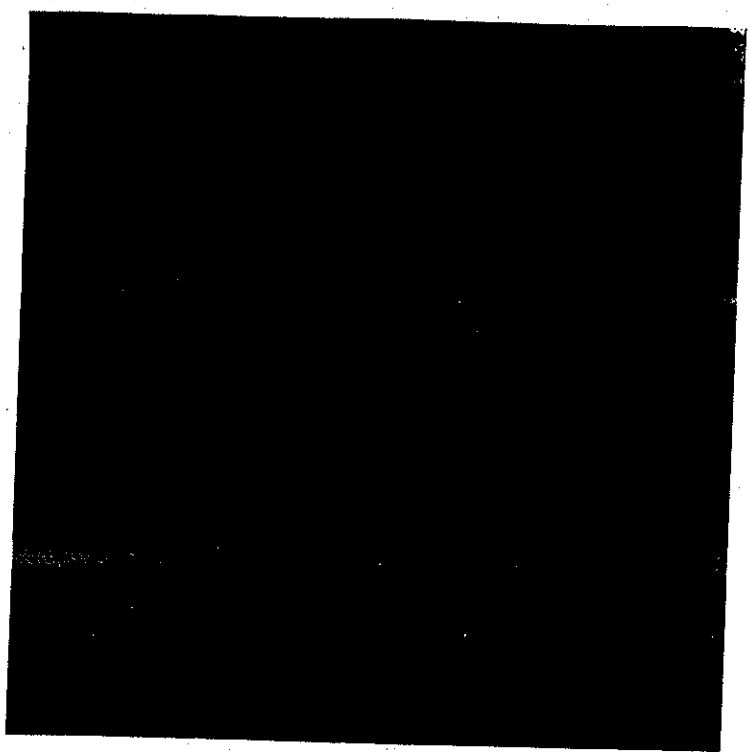


TUBIZE X-SECTION. VAT DYE. DIRECT LIGHT.

4 mm objective.

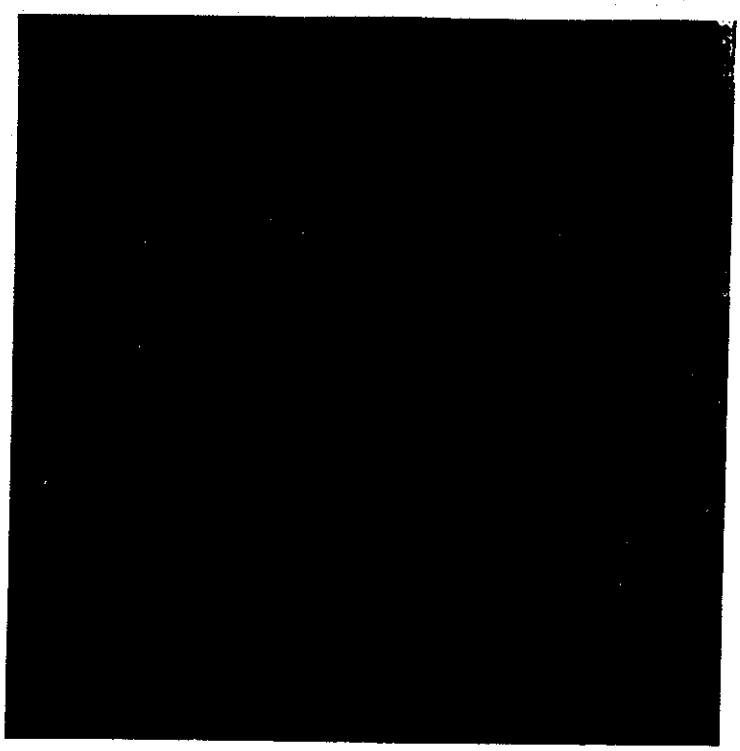
TUNIZE X-SECTION IN PARAFFIN, SET # 11, DIRECT DYE.

Direct light. 8 mm objective.



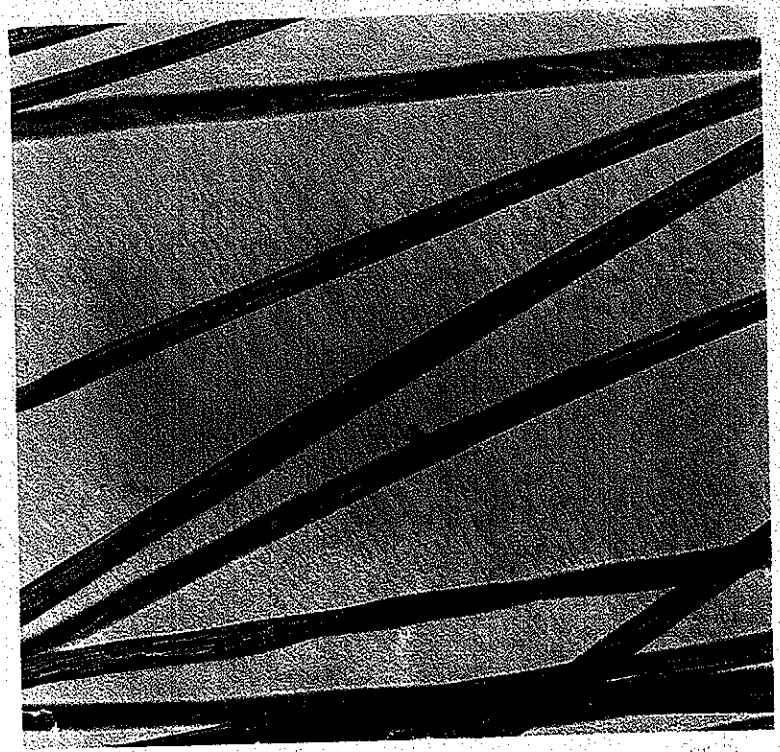
VISCOSE YARN AS IS. SILVERMAN ILLUMINA TOR

48 mm objective,

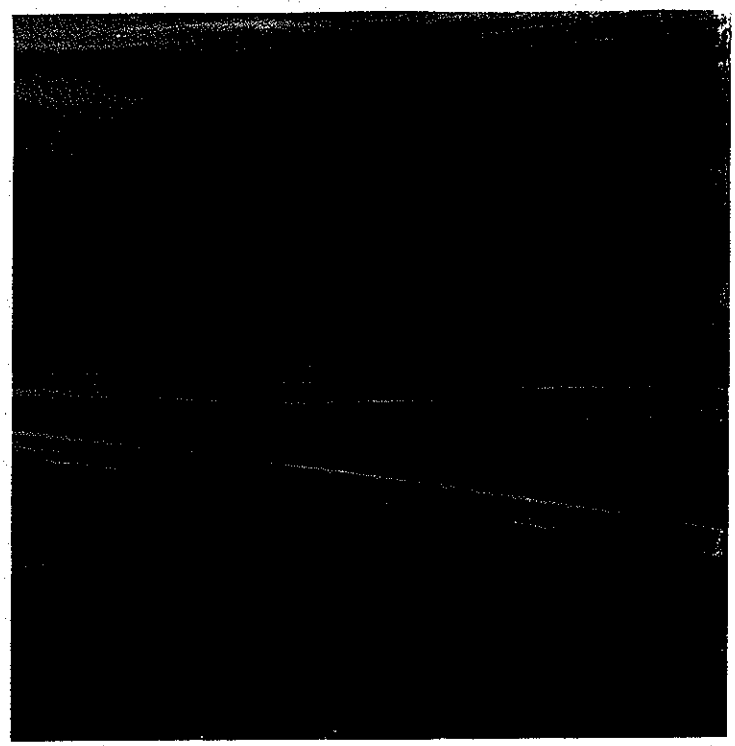


VISCOSE YARN. SRA DYE. SILVERMAN ILLUMINATOR

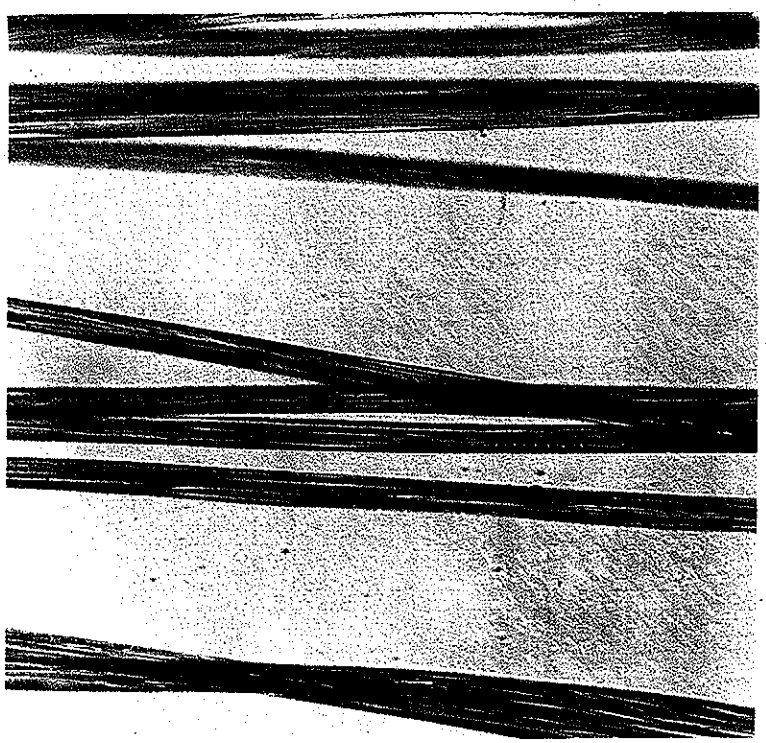
48 mm objective.



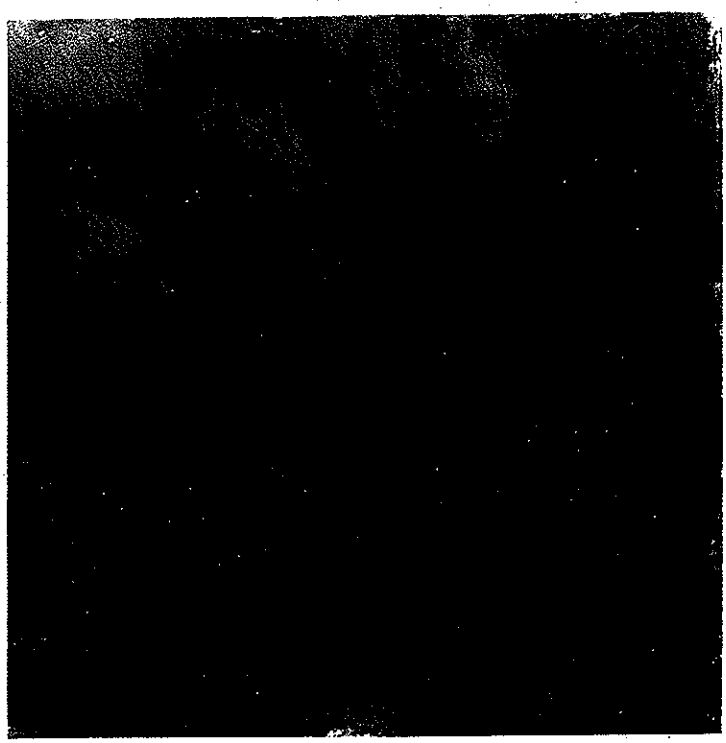
VISCOSE FILAMENTS, [illegible] IS. 16 mm objective. DIRECT LIGHT



VISCOSE FILAMENTS AS IN. 194 X. USING THE SILVERMAN.



VISCOSE FILAMENTS. 194 X. Transmitted light.



VISCOSE FILAMENTS X-SECTIONS. VAT DYE. DIRECT LIGHT.

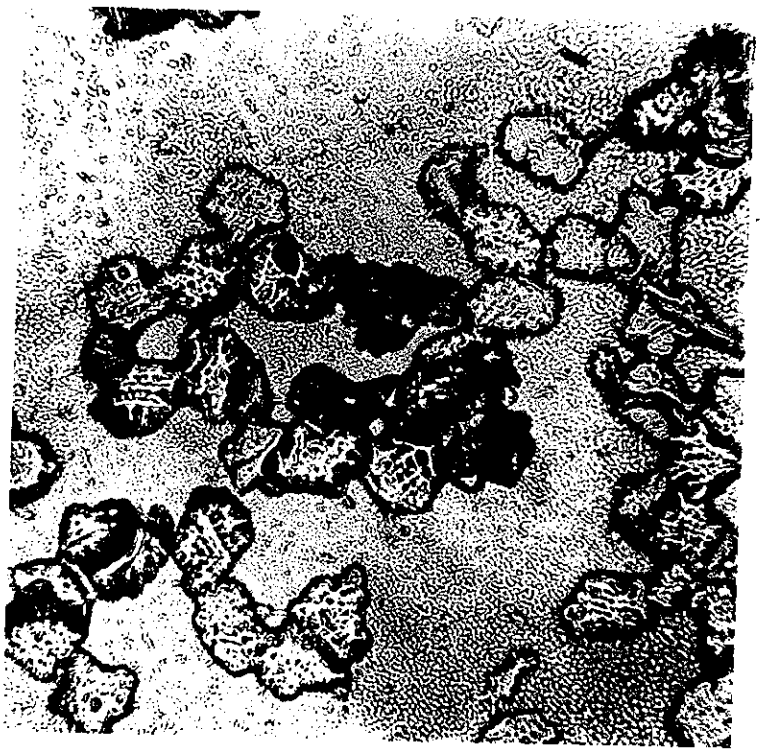
4 mm objective.

VISCOSE FILAMENTS AS IS. DIRECT LIGHT.

4 mm objective.

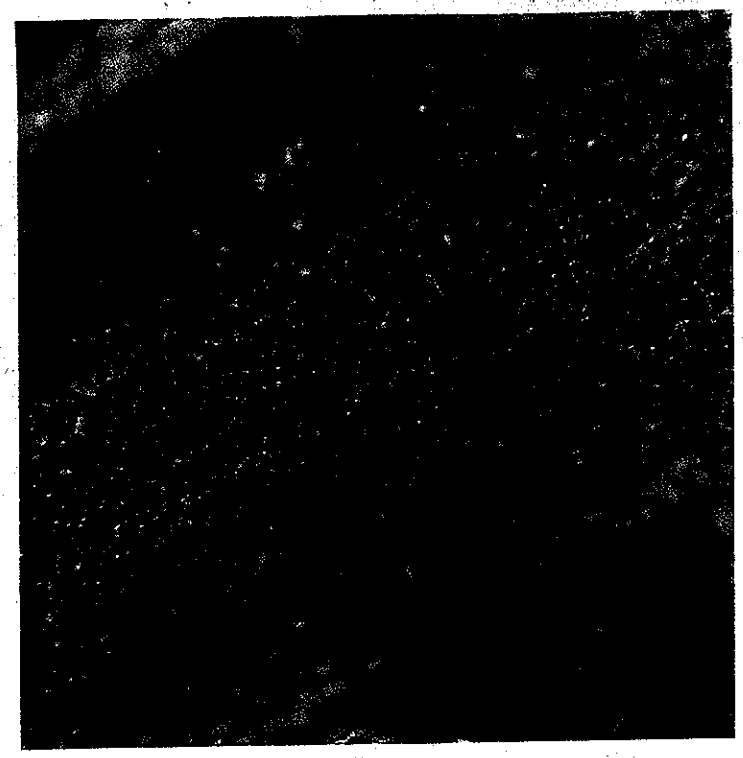
VISCOSE FILAMENTS X-SECTION. DIRECT LIGHT. BASIC DYE.

4 mmobjective.

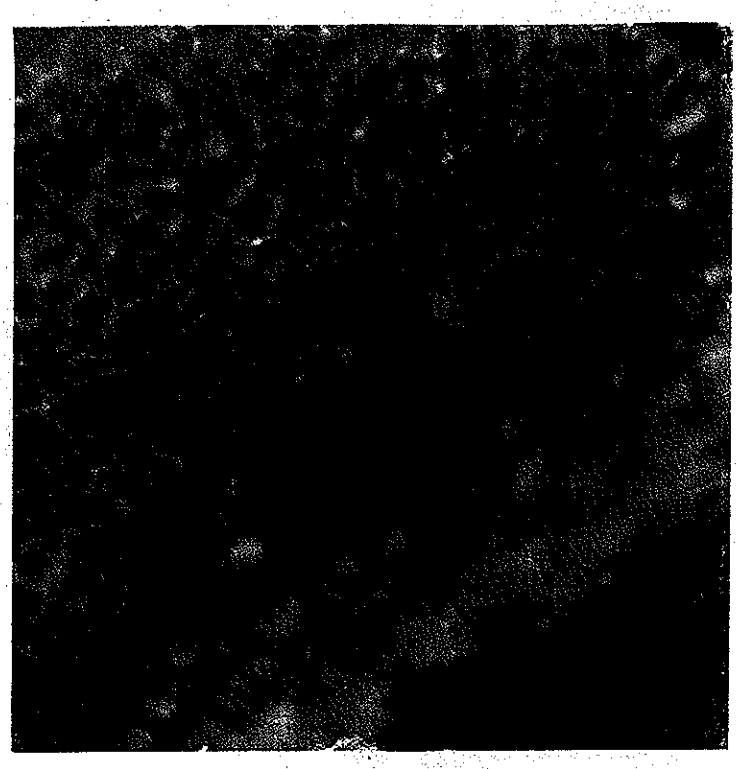


VISCOSE X-SECTION IN PARAFFIN, AS IS. 8 mm Objective.

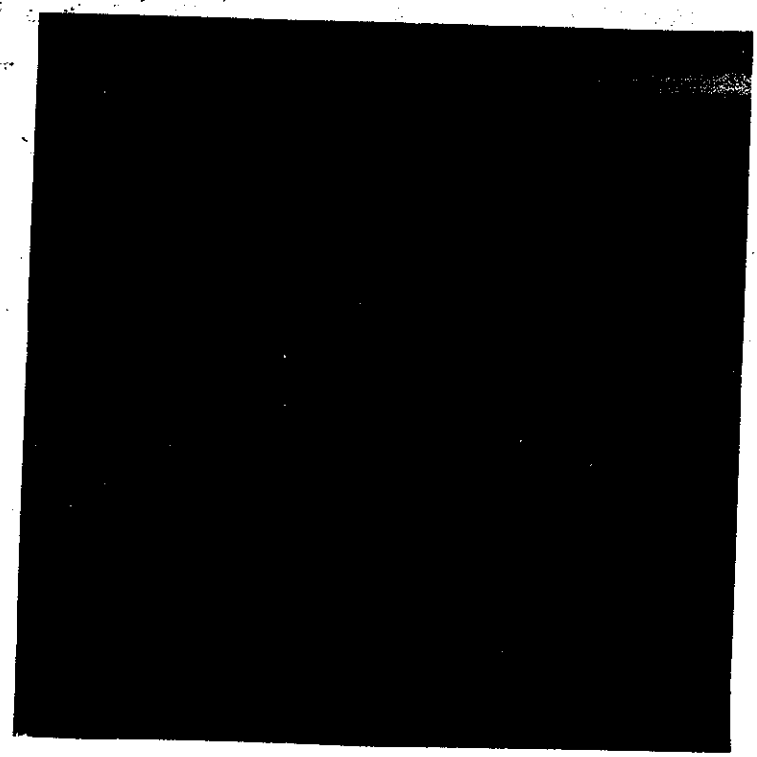
USING VERTICAL ILLUMINATOR WITH LIGHT ATTACHED.



VISCOSE X-SECTION IN BRASS. 16 mm Objective. USING THE SILVERMAN ILLUMINATOR

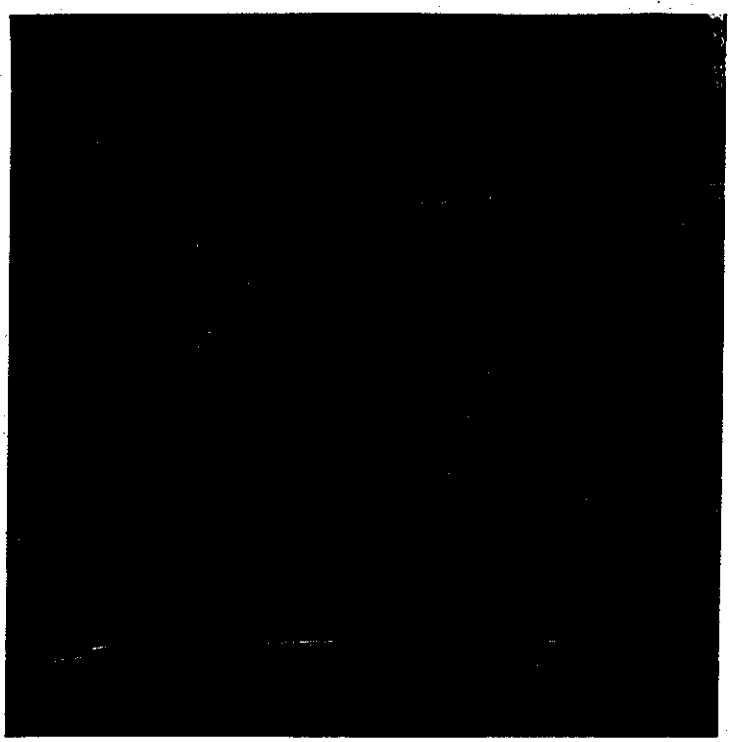


VISCOSE X-SECTION IN BRASS. 8 mm Objective. USING THE SILVERMAN ILLUMINATOR.



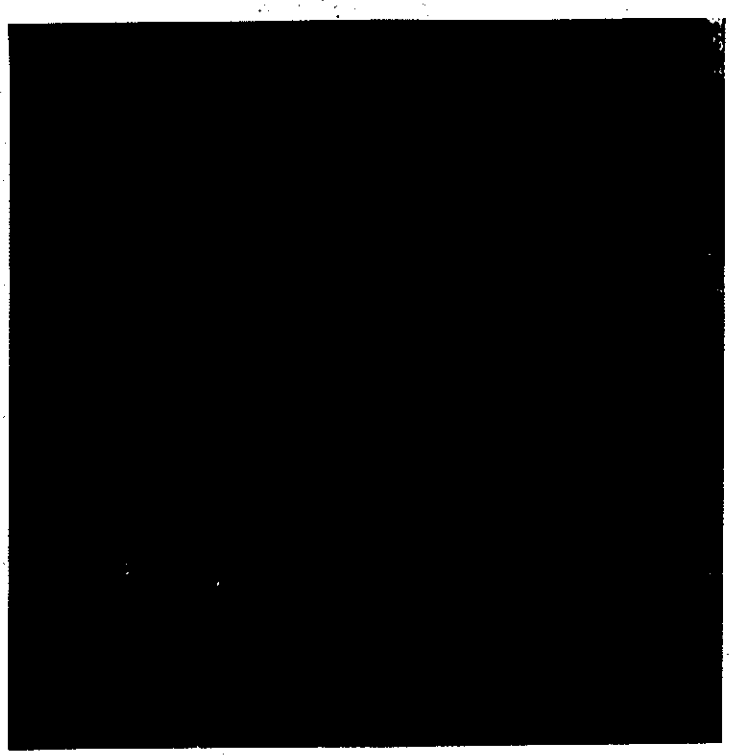
DUPONT XANTHATE YARN AS IS. SILVERMAN ILLUMINATOR

48 mm objective.



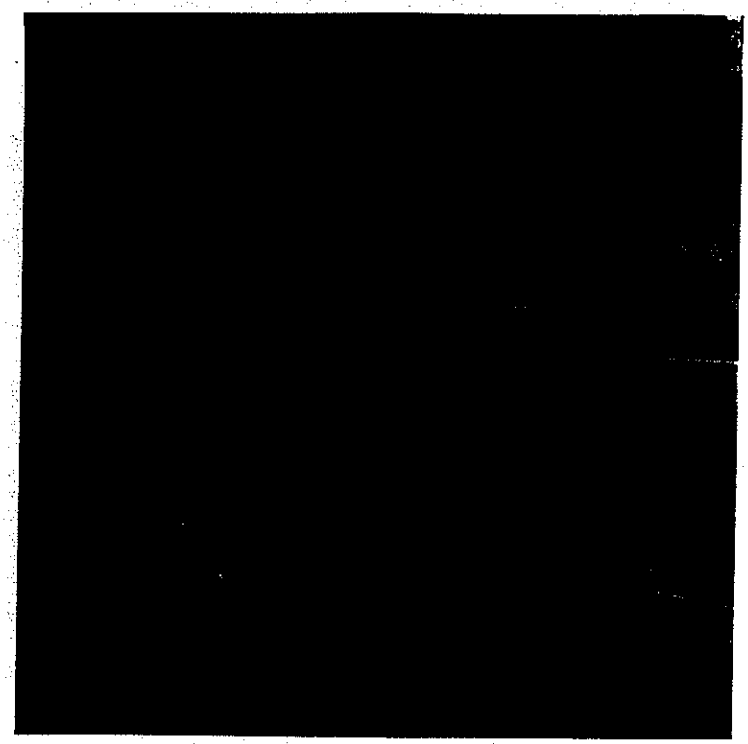
DUPONT XANTHATE YARN. DIRECT DYE. SILVERMAN ILLUMINATOR

48 mm objective.



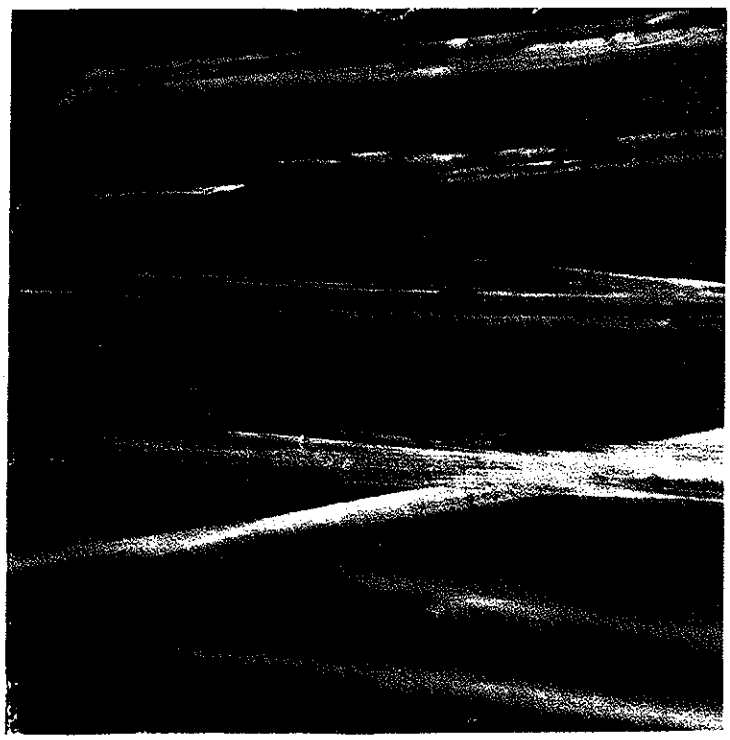
DUPONT XANTHATE YARN. SRA DYE. SILVERMAN ILLUMINATOR

48 mm objective



DUPONT XANTHATE FILAMENTS. VAT DYE. SILVERMAN ILLUMINATOR

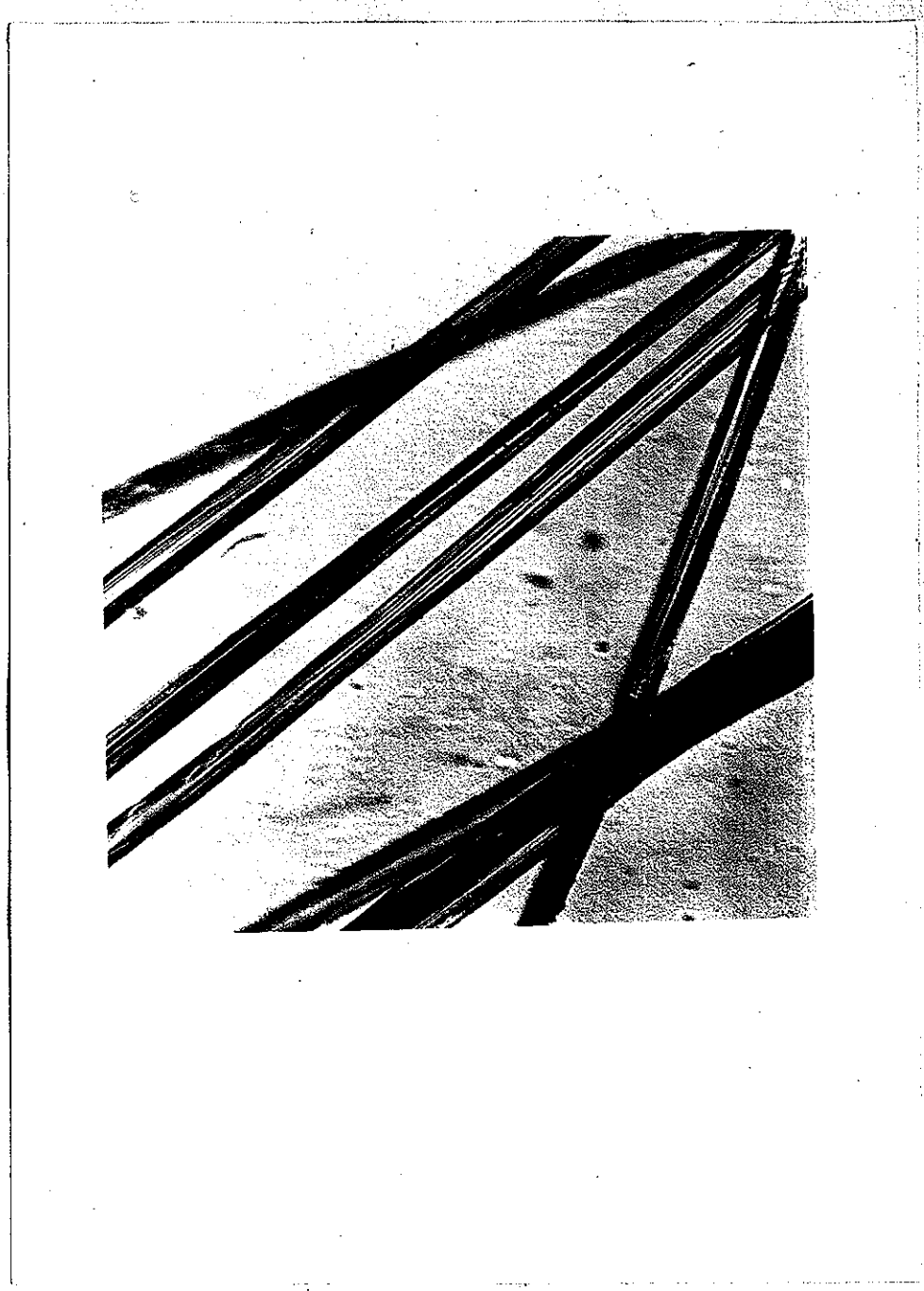
16 mm objective



DUPONT XANTHATE FILAMENTS. AS IS. SILVERMAN ILLUMINATOR.

16 mm objective.

DUPONT XANTHATE FILAMENTS, AS IS. 16 mm Objective. USING THE SILVERMAN ILLUMINATOR.



DUPONT XANTHATE. 194 X FILAMENTS. Transmitted light.
As is.

DUPONT XANTHATE X-SECTION. BASIC DYE. DIRECT LIGHT.

4 mm objective.

DUPONT KANSAS X-SECTION IN PARAFFIN. Set # 11, DIRECT.

Direct light. 4 mm Objective.

VIII

ANALYZING TESTS AND THE EVIDENCE.

In analyzing the various charts, a general analysis will be made of those charts concerning the same tests. Chart I: sets 7, 8, 9 and 10 show loss in lustre: this being due, as shown in remarks on the acetate types, to the high temperature which causes the acetate radicals to be removed from the cellulose-acetate molecule leaving cellulose only. Set 10 also shows the chemical reaction wherein the acetate radical and the alkaline sodium carbonate have reacted to leave the cellulose alone deprived of its acetate radical.

Set 1, 2 and 11, direct dyes, show the results of unsympathetic phases as described in colloidal dyeing.

Set 12, 13 and 14, basic dyes, show that dyes of the same classes will not act in the same manner; due to high and low dispersion phases.

Sets 15, 16 and 17, vat dyes, also show in the same manner as sets 1, 2 and 11, the unsympathetic phases present, in the case of the blue vat , and the sympathetic phase being present with the red vat.

Set 18, 19 and 20, as would be expected, show that the dyes and the fibres have sympathetic phases and so deep dyeing is obtained.

Sets 21 and 22, acid dyes, show a chemical as well as a colloidal dyeing, as the fibre affects the color of the dye.

Chart II; this is interesting from the fact that the Bemberg has acted so uniformly in so many cases. Sets 3 to 10 inclusive show no change in the appearance.

Sets 1,2,11, 15 ,16 and 17 have acted in the same way as cotton which is to be expected in a straight cellulose product such as this regenerated cellulose.

Sets 12, 13 and 14, basic dyes, have differed from cotton in that they have dyed well without the use of tannic acid and tartar emetic which are needed with the basic dyes to get good dyeing on cotton. This is due to the dispersion phase; cotton being unsympathetic and the Bemberg sympathetic.

Sets 18, 19 and 20, SRA dyes, which are made to be sympathetic with acetate silks, show their unsympathetic phase with this cupra silk.

Sets 21 and 22, acid dyes, differ from cotton in that they exhibit a sympathetic phase for the cupra silk.

Chart III, which is of Celanese cross-section exhibits exactly the same characteristics as the DuPont Acetate type. If it had done otherwise, it would have been very strange as the fibres are supposed to be

identical in composition.

Chart IV; Tubize; these cross-sections also showed their near relationship to cotton in most of the tests. Sets 3 to 10 inclusive, showed no change, neither would cotton under the same tests.

Set 1, 2 , 11, 15, 16 and 17 ; direct and vat dyes acted exactly like cotton.

With sets 12, 13 and 14, basic dyes, the fibre from the nitro group acted in a simialr manner to the fibre from the cupra group; thus both must have a dispersion phase sympathetic to basic dyes.

Sets 18, 19 and 20, SRA dyes, showed some staining, which means that the dispersion phase was not altogether unsympathetic.

Sets 21 and 22, acid dyes, gave uneven dyeing.

Chart V; Viscose; in these tests of sets 3 to 7 inclusive which were made with soap and hot water, it is quite evident that the oil used in the making of the Viscose has been removed to leave the fibre cleaner and thus whiter. This is a purely physical and not chemical reaction.

Sets 8, 9 and 10 with salts, act in the same manner as cotton.

Sets 1, 2 and 11, direct dyes, and sets 15, 16 and 17, vat dyes show a very sympathetic phase pre-

sent. The dyeings are the same as cotton with possibly a trifle deeper shade.

Set 18, 19 and 20 show the unsympathetic phase when SRA dyes are being used. This is also similar to cotton.

Sets 21 and 22, acid dyes, show a deep stain due to a low dispersion phase.

Chart VI; DuPont Xanthate; this type is the duplicate of Viscose and it naturally gave the same results; in fact it is hard to pick out one from the other after dyeing together.

Chart VII is interesting only in that it gives the comparative size of the filaments of the six types. It also gives their various appearances. Using the ocular micrometer, with Bemberg the smallest of the fibres being given a diameter of 3, the others rate as follows: Tubize 4; DuPont acetate and Celanese, 5.5; Viscose and DuPont Xanthate, 6.5

Charts VIII, IX and X give sizes of the yarns "AS IS", after treating with Direct Dye, also with and without scouring.

Dupont Acetate is 7, 6.5 and 6.5; Bemberg 7;5, 7, and 6; Celanese 7,7 and 7; Tubize 6.5, 6, and6; Viscose 6.5, 6.5 and 7; DuPont Xanthate 6.5, 6.5 and 6.5. In this case, the Celanese and the DuPont Xanthate showed the least change after treating, Bemberg showed the most.

Chart XI , appearance of the filaments after treatment shows that eight of the tests reported styrations; fifteen , bubbles; eleven, rough or eroded; two, dull; and one, adhering particles.

The styrations on the DuPont acetate were present in many cases, and not enough difference was noted to be of value. This also goes for the tests showing bubbles. These bubbles, so-called, appear in different planes as the working distance of the microscope is changed. They are called bubbles rather than spots because they are so similar in looks to bubbles. The rough places were expected to show up in the vat dyes where alkalies were used and also with the soda ash, but they were also present with one direct dye, soap 1 to 1000 and not 1 to 100, common salt, Glauber salt and both acid dyes. No reason is placed forth for the roughness in these cases and not in the remaineder which did not show roughness. The dullness comes to acetate type silks when heated with alkalies or in water solutions at the boil.

The diameter of the filaments were not noticably ~~diffe-rent~~.different, averaging 5.5

Chart XII, Bemberg filaments, runs very uniformly. In two cases there were adhering substances of very minute ~~size. Bubbles~~ appeared in four cases with but one test each of the direct, basic, vat and

SRA dyes. This wide-spreading of the bubbles would not tend to show that any particular class of dyes would cause them. One of the acid dyes gave roughness, and this also could not be taken as proof positive that acid dyes cause roughness on Bemberg filaments.

Chart XIII, Celanese; the "AS IS" mount showed bubbles and deep styrations, so did 13 of the other mounts show deep styrations and 7 showed bubbles. These were also wide spread over the various tests. The vat dyes, the soda ash and the soap at a boil showed a roughness due to the alkali action. Adhering particles were observed in two cases. With the soap 1 to 100 at a boil, common salt and Glauber salt, a decided twist was noticed in the filaments.

Chart XIV, Tubize, "AS IS" showed few bubbles and wide deep styrations which also appeared in 15 of the mounts as deep styrations and in 13 the bubbles scattered throughout the tests. One noticeable feature ws the number of tests showing rough places, which included two soap tests, one vat dye, one SRA dye and one acid dye. Whether this is due to the dyes and chemicals or to handling should be handled in further tests.

Chart XV, Viscose, the main point developed with these tests was the presence so noticeable of distinct styrations in almost all cases. Bubbles were also present in many cases and could be brought out by

changing the working distance. In some cases the styrations were wavy or twisted and in others they were straight, with a greater field, both types might appear on the same filament, this also could be worked out in a greater thesis study.

Chart XVI, DuPont Xanthate, was very similar to the Viscose chart with slightly greater number of tests reporting the distinct filaments.

A study of the photomicrographs will reveal some interesting points. Page 115 and 116 show DuPont Acetate yarn taken by aid of the Silverman Illuminator, this photos show the slight twist and specks mentioned in Chart VIII.

On page 120 is good representation of the deep styrations mentioned as occuring in DuPont Acetate. This was taken with reflected or transmitted light and shows to better advantage than the three previous photos taken with the Silverman Illuminator.

The DuPont Acetate cross-sections seemed to reflect the light and were hard to take, however, on page 122 is an illustration of the deeply serrated rayon.

On pages 123 and 125 will be found two pictures of Bemberg yarn which will serve to show that the comparative size was the same before and after dyeing. On the "AS IS" mount, the twist is discernible.

Pages 126, 127, 127 and 128 are Bemberg filaments taken with the Silverman Illuminator and show styrations, but on pages 130 and 131 are much better illustrations of this filament in which the round shape can be seen. These were taken by direct light.

On pages 133, 134 and 135 are photos of cross sections of Bemberg mounted in paraffin; these serve to show the shape of the filaments. On page 136 is another picture taken with lower power objective using the vertical illuminator, which also shows the shape of this type. This can be compared with page 139 which shows approximately the same magnification but the picture was taken with direct light which in some cases has been reflected.

On pages 138, 140 and141 are shown pictures taken form cross sections in the brass blocks. These are the truest pictures of the actual appearance of the filaments as the yarn has not been subjected to the paraffin mounting. It is rather difficult to get all the filaments in focus at the same time and also some dyed filaments can not be taken in this method. The largest or strongest objective that can be used is 8mm and this does not allow taking of very much enlarged views.

On page 142 can be noted the Celanese yarn with a slight twist; on page 143 is shown the Celanese yarn as mentioned in Chart IX with a few specks and opened up.

Pages 144, 145 and 146 show filaments taken with the Silverman Illuminator, but there is too much reflection. On page 147 is a fine example of the "AS Is" Celanese filament mentioned in Chart XIII showing the wide deep styrations and the bubbles.

On page 149 is a good picture of the cross-section of vat dyed Celanese filaments mounted in paraffin and taken with direct light. Note the shapes of the sections.

On page 153 is a picture of Tubize yarn showing the twist as mentioned in Chart VIII.

Pages 154 and 155 illustrate Tubize filaments "AS IS" with the Silverman Illuminator and also with direct light. The styrations and bubbles of Chart XIV can be seen in both cases.

On page 156 is a picture of a cross section of Tubize showing the shape of the filaments.

A close view of the fibre at the bottom of the picture on page 160 will show the twist of Viscose yarn mentioned in Chart VIII.

The distict styrations mentioned in Chart XV about Viscose filaments are plainly shown in the pictures on pages 162, 163 and 164 taken by direct light and with the Silverman illuminator.

On page 166 is the finest photomicraph of the set showing three viscose filaments cross-sectioned

in paraffin taken with direct light. The shape of the filaments is outlined as plainly as though drawn. On pages 165, 167 and 168 are some other cross sectioned paraffin pictures, but not as clear as the one mentioned.

With the brass block method, a good picture shown on page 169 was secured of Viscose, but when a larger magnification was attempted as shown in picture on page 170, there was too much reflection.

DuPont yarn is shown on page 171 with the twist mentioned in Chart VIII.

The picture on page 177 illustrates the styrations mentioned in Chart XVI as being so distinct on DuPont Xanthate.

On pages 178 and 179 are the cross section pictures of paraffined mounted DuPont filaments. Note the cruller shaped sections which are peculiar to this type and so different from the shape of its sister filament Viscose.

IX

CONCLUSIONS.

The microscope can be used to determine the penetration of dyestuffs on rayons or artificial silks. A study of the dyed fibres under the microscope will enable a person to determine whether dyeing or staining has taken place. By this is meant that in dyeing the fibre is uniformly colored with the dye stuff, whereas with staining, the penetration is not uniform.

The degree of bleaching previous to dyeing can be studied with the microscope and any faults can be detected which have served to spoil the fibre or filaments composing the fibre.

The effect of the twist of the yarn can be studied as to its effect on dyeing.

Loss of lustre which affects dyeing can be determined by use of the microscope.

The presence of foreign matter from the preparation of the fibre can be studied. Such material as sulphur from the sulphides used in making rayon of the zanthate type.

The effect of chemicals used as assistants in dyeing; as an example the effect of alkalies used in vat dyes. These were shown to eat into or roughen.

A study with the microscope of the effect on the penetration of the dyestuff on yarn that opens up in dyeing whether caused by heat or handling.

The effects of chemicals such as soap used in scouring and dyeing can be studied with the microscope.

In finished dyeing, the nature of adhering matter or specks can be studied to determine their effect on the penetration of the dyestuffs.

With the equipment now at the Textile School it is possible to do all of the above mentioned, but in order to do better work, it would be necessary to have apochromatic objectives corrected for color.

With the present apparatus it is not possible to study the molecular construction of the filaments before and after dyeing. This could be done by X-Ray photography.