



(12) **United States Plant Patent**
Abrahamson et al.

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- (54) **FAST-GROWING SHRUB WILLOW NAMED ‘OWASCO’**
- (50) Latin Name: *Salix viminalis*×*Salix miyabeana*
Varietal Denomination: **Owasco**
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- (*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 45 days.
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A01H 5/00 (2006.01)
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- (58) **Field of Classification Search** Plt./226,
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See application file for complete search history.

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(57) **ABSTRACT**

A distinct female cultivar of *Salix viminalis*×*Salix miyabeana* named ‘Owasco’, characterized by rapid stem growth producing greater than 49% more woody biomass than one of its parents (‘SX64’) and 39% more biomass than a current production cultivar (‘SV1’). ‘Otisco’ produced greater than 2.7-fold more stem biomass than two other current production cultivars, ‘SX67’ and ‘SX61’. ‘Owasco’ can be planted from dormant stem cuttings, produces multiple stems after coppice, and the stem biomass can be harvested when the plant is dormant. In the spring following harvest, the plant will re-sprout very vigorously, producing new stems that can be harvested after two to four years of growth. This harvest cycle can be repeated several times. The stem biomass can be chipped and burned as a source of renewable energy, generating heat and/or electricity. ‘Owasco’ displays a low incidence of rust disease and is not damaged by potato leafhoppers.

10 Drawing Sheets

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STATEMENT AS TO RIGHTS TO INVENTIONS
MADE

UNDER FEDERALLY-SPONSORED RESEARCH
AND DEVELOPMENT (IF ANY)

The invention described herein was reduced to practice during the funding period of Contract 4000003235 (SUNY Research Foundation Award 011275) awarded by Oak Ridge National Laboratory, managed by UT-Batelle for the United States Department of Energy under contract DE-AC05-00OR22725.

CROSS-REFERENCE TO RELATED
APPLICATIONS

This application is related to the following plant patent applications, all of which are subject to assignment to the Research Foundation of the State University of New York, and each of which is being filed on even date herewith: “Fast-Growing Shrub Willow” Named ‘Fish Creek’, application Ser. No. 11/244,988; “Fast-Growing Shrub Willow” Named ‘Canastota’, application Ser. No. 11/244,986; “Fast-Growing Shrub Willow” Named ‘Millbrook’, application Ser. No. 11/244,636; “Fast-Growing Shrub Willow” Named ‘Oneida’, application Ser. No. 11/244,975; “Fast-Growing Shrub Willow” Named ‘Otisco’, application Ser. No. 11/244,987; and “Fast-Growing Shrub Willow” Named

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‘Tully Champion’, application Ser. No. 11/244,635. The variety of fast-growing shrub willow named ‘Owasco’ was produced in the same willow breeding program as were other varieties, including ‘Fish Creek’, ‘Canastota’,
5 ‘Millbrook’, ‘Oneida’, ‘Otisco’, and ‘Tully Champion’.

BACKGROUND OF THE INVENTION

1. Field of the Invention

10 The invention is a new and distinct cultivar known by the varietal name ‘Owasco’ resulting from the novel hybridization of *Salix viminalis* with *Salix miyabeana*. The new variety was produced through controlled willow in Syracuse, N.Y. The objective of the breeding program is to
15 produce new willow cultivars that generate high biomass yields on a variety of sites, are resistant to diseases and pests, and possess agronomic traits suitable for mechanical planting, harvesting, and post-harvest processing. Shrub willow is being developed as an agricultural crop plant that
20 will be grown and harvested as a sustainable, renewable source of energy. Once a field planting of shrub willows is established, the woody stems can be harvested every three years, and new shoots will re-sprout the following season. Repeated harvesting every two to four years can be sus-
25 tained for at least 15 years.

2. Description of Relevant Prior Art Including Information Disclosed Under 37 CFR 1.97–1.99

This new variety of *Salix viminalis*×*Salix miyabeana* was the seedling progeny of the controlled pollination of the

female clone *Salix viminalis* 'SV7' by the male clone *Salix miyabeana* 'SX64' performed in February 1999 in Syracuse, N.Y. The plant has been propagated repeatedly by stem cuttings and has been found to retain its distinctive characteristics through successive propagations and field trials. More Specifically, the plant has been asexually reproduced by collecting dormant stems during the winter months from a plant growing in Syracuse, N.Y.; cutting them into either 5" or 10" pieces (cuttings); then planting those cuttings in the field in Tully, N.Y. in the spring or in potting mix in the greenhouse, then transplanting the rooted cuttings to the field in Tully, N.Y.

Both parents were originally transferred from Toronto, Ontario, Canada to Syracuse, N.Y. and were vegetatively propagated from stem cuttings. The female parent (*S. viminalis* 'SV7') was transferred in 1990, while the male parent (*Salix miyabeana* 'SX64') was transferred in 1994. The growth of the parent plants was characterized in nursery plantings in Tully, N.Y. The male clone *Salix miyabeana* 'SX64' displayed rapid stem growth and low incidence of rust disease, so was chosen to serve as a parent in a cross with *S. viminalis* 'SV7', which suffered from susceptibility to the potato leafhopper (*Empoasca fabae*). The seedlings produced by this cross (identification #99207) were first established in a greenhouse, and then were transplanted to a field in Syracuse, N.Y. This particular individual (identification #99207-018) was selected from the family due to its exceptional stem height growth. The new variety is distinguished from the female parent in that the female parent (*Salix viminalis* 'SV7') has leaves that are narrowly lanceolate and with acute apex. They are pubescent underneath with raised veins and margins are entire. Mature leaves of variety 'Owasco' are lanceolate with acuminate apex, upper and lower surfaces are glabrous and margins are serrulate.

The new cultivar has been grown in Syracuse, N.Y. and Tully, N.Y., which have a normal yearly average daily temperature of 47° F., normal daily maximum temperature in July of 82° F., normal daily minimum temperature in January of 14° F., and average precipitation of 40 inches. The new cultivar grows from a rooted cutting to a fully mature plant ready for harvest in approximately three years.

SUMMARY OF THE INVENTION

The *Salix viminalis*×*S. miyabeana* cultivar 'Owasco' has not been observed under all possible environmental conditions. The phenotype may vary somewhat with variations in environments such as temperature, light intensity and length of illumination, without, however, any variation in genotype. The new and distinct cultivar presents the following traits that have been repeatedly observed and are determined to be the unique characteristics of 'Owasco'. These characteristics in combination distinguish 'Owasco' as a new and distinct cultivar:

1. Rapid growth rate, producing greater than 49% more woody biomass than one of its parents (*Salix miyabeana* 'SX64'), 39% more biomass than one current production cultivar (*Salix dasyclados* 'SV1'), and more than 2.7-fold more biomass than two other production cultivars (*Salix miyabeana* 'SX67' and *Salix sachalinensis* 'SX61') when grown in the same field for the same length of time (two growing seasons after coppice) in Tully, N.Y.
2. Resistance to potato leafhopper, which causes severe stunting of growth, curling of the leaves, and overall

decline in vigor (all characteristic of hopper burn) on the female parent, *S. viminalis* 'SV7'.

3. Low incidence of rust disease assessed in experimental trials in Syracuse, N.Y. in 2000.

Additionally, the new variety of plant named 'Owasco' is distinguished from other related (similar) cultivars in that the variety 'Owasco' is a hybrid of *Salix viminalis* and *S. miyabeana*, as are varieties 'Otisco' and 'Tully Champion'. The parentage of 'Owasco' (*Salix viminalis* 'SV7'×*S. miyabeana* 'SX64') differs from that of 'Tully Champion' (*Salix viminalis* 'SV2'×*S. miyabeana* 'SX67') and 'Otisco' (*Salix viminalis* 'SV2'×*S. miyabeana* 'SX64'). Yield trial results indicate that 'Owasco' produces greater biomass yield (15.45 oven dry tons ha⁻¹ year⁻¹) than either 'Tully Champion' (14.02 oven dry tons ha⁻¹ year⁻¹) or 'Otisco' (14.78 oven dry tons ha⁻¹ year⁻¹). The bark of two-year stems of 'Owasco' is mostly smooth, while that of 'Otisco' is textured with vertical fissures and cracks. 'Owasco' is glabrous on the portion of the stem immediately adjacent to dormant vegetative buds (FIG. 1.3), while 'Tully Champion' displays pubescence in the region of stem adjacent to the dormant vegetative buds. Typical leaves of 'Tully Champion' are more lanceolate with acute apex than those of 'Owasco'. 'Owasco' typically produces five leafy bracts at the base of the catkin, while 'Tully Champion' and 'Otisco' typically produce four leafy bracts at the base of the catkin.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying color photographs show the features of the claimed cultivar in a manner as true as is reasonably possible. The illustrations include:

FIG. 1.1 illustrates two-year-old portion of stem collected while dormant;

FIG. 1.2 illustrates one-year-old portion of stem collected while dormant;

FIG. 1.3 illustrates a vegetative bud in dormancy;

FIG. 1.4 illustrates a floral bud in dormancy;

FIG. 1.5 illustrates new shoot growth from a stem cutting rooted in soil:sand in a greenhouse;

FIG. 1.6 illustrates upper leaf surface;

FIG. 1.7 illustrates lower leaf surface;

FIG. 1.8 illustrates mature catkin;

FIG. 1.9 illustrates pistil and densely pubescent floral bract; and

FIG. 2.1 illustrates Biomass yield two years after coppice at Tully, N.Y.

DETAILED DESCRIPTION OF THE NEW PLANT

The following detailed description sets forth characteristics of the new plant. The following observations and measurements describe plants grown by asexual reproduction in Syracuse, N.Y. or Tully, N.Y. under conditions as described hereinabove. Color references are made using The Royal Horticultural Society Colour Chart (hereinafter The R.H.S. Colour Chart) of The Royal Horticultural Society of London, England, except where general terms of ordinary dictionary significance are used.

BOTANICAL DESCRIPTION OF THE PLANT

The following detailed description of the 'Owasco' variety is based on observations from 10 inch cuttings grown in a greenhouse in Syracuse, N.Y. Cuttings were grown in 7

inch tubes in a (1:1) ProMix®/sand (v/v) substrate under natural light from December 2004 to March 2005. Plants were irrigated with automatic misting for 6 minutes every 2 hours five times each day.

Latin name: *Salix viminalis*×*S. miyabeana*.

Varietal denomination: ‘Owasco’.

Parentage:

Female or seed parent.—*S. viminalis* ‘SV7’.

Male or pollen parent.—*S. miyabeana* ‘SX64’.

Propagation:

Type.—Stem cutting.

Time to rooting.—Approximately 10 days in water at 21° C.

Precocity: Subprecocious — Catkins mature as leaves begin to break bud.

Plant description: The color of one-year-old stem cuttings observed when dormant are grey orange (RHS 171A), while two to three-year-old stems are yellow-green (RHS 152C) smooth, lustrous, and glaucous. Vegetative buds are red-orange (RHS N172B), ovoid, acute, and typically 3.5–4.0 mm in length. Lenticels are large, wart-like, numerous, brown to red, and lighter in the center. The leaves are simple and alternate with pinnate venation. Typical petioles on mature leaves grown under field condition in early October are 3 mm in length, green-yellow (#1C) and 2.0–3.0 mm in diameter. The petiole in FIGS. 1.6–1.7 from a greenhouse-grown plant is green (#143D) and 1 mm in diameter. Stipules are typically 2 mm in length, ovate, and slightly curved, and serrulate. Immature leaves have a few small hairs. Mature leaves are lanceolate, acuminate apex, acute base, typically 7.5–9.0 cm in length, 1.4–1.8 cm in width, serrulate margin, adaxial (upper) surface green (RHS 144A), abaxial (lower) surface pale green (RHS 144B), and stem light pale green (RHS 144C) at 7½ weeks of growth. The upper surface of field-grown leaves in early October is glabrous and glossy with distinct pinnate venation. The lower surface is glabrous and slightly glaucous. The typical diameter of two-year old stems at a height of 1 m is 1.6 cm. The bark color of field-grown stems determined in early October after two growing seasons is green (#137C). The surface is smooth with raised reddish len-

ticels. The average plant height of a mature plant after three seasons of growth is 5–6 m with a typical spread at the crown of 1.0–1.5 m when grown in the typical planting spacing of 0.6×0.7 m.

Flowering description: Dormant floral buds are elongated, acute, ovoid, beak-like apex, typically 8.5 mm in length, appressed, and red (RHS 180B). Peduncle of catkin is typically 4 mm in length and bears 5 leafy bracts. Catkins are narrowly cylindrical, erect, typically 2.4 cm in length as measured along the arc of the axis of the catkin, and densely flowered. Flowers have a short, narrow, densely hairy ovary on a pedicel with a very long style (length of ovary) and 2 long and curled stigmas. Floral bract is densely pubescent, pink, and obtuse.

Field growth characteristics: Determined through surveys of plants growing in the field in Tully, N.Y. and at the LaFayette Road Experiment Station in Syracuse, N.Y.

Disease resistance: Displays a low incidence of rust disease.

Temperature tolerance: Stems typically do not suffer frost damage at temperatures as low as 10° F. and may suffer only minor tip dieback at lower temperatures.

Seed production: ‘Owasco’ produces only female flowers, so viable seeds will only be produced after pollination by a compatible male variety. This has not yet been observed in field trials.

Biomass yield: Mean dry stem biomass yield produced through two growing seasons after coppice in each of eight four-plant plots (‘Owasco’, 15.45 oven dry tons ha⁻¹ yr⁻¹) measured in a yield trial growing at the Tully Genetics Field Station in Tully, N.Y. in February 2005 was 49% greater than the mean stem biomass yield of one of its parents (‘SX64’, 10.35 oven dry tons ha⁻¹ yr⁻¹) and was 39% greater than a current production cultivar (‘SV1’, 11.04 oven dry tons ha⁻¹ yr⁻¹) growing in the same trial (FIG. 2.1). ‘Owasco’ produced greater than 2.7-fold more stem biomass than two other current production cultivars (‘SX67’, 5.52 oven dry tons ha⁻¹ yr⁻¹; ‘SX61’, 4.83 oven dry tons ha⁻¹ yr⁻¹) growing in the same trial (FIG. 2.1).

What is claimed is:

1. A new and distinct variety of a *Salix viminalis*×*Salix miyabeana* plant, substantially as illustrated and described herein.

* * * * *

Fig. 1.1

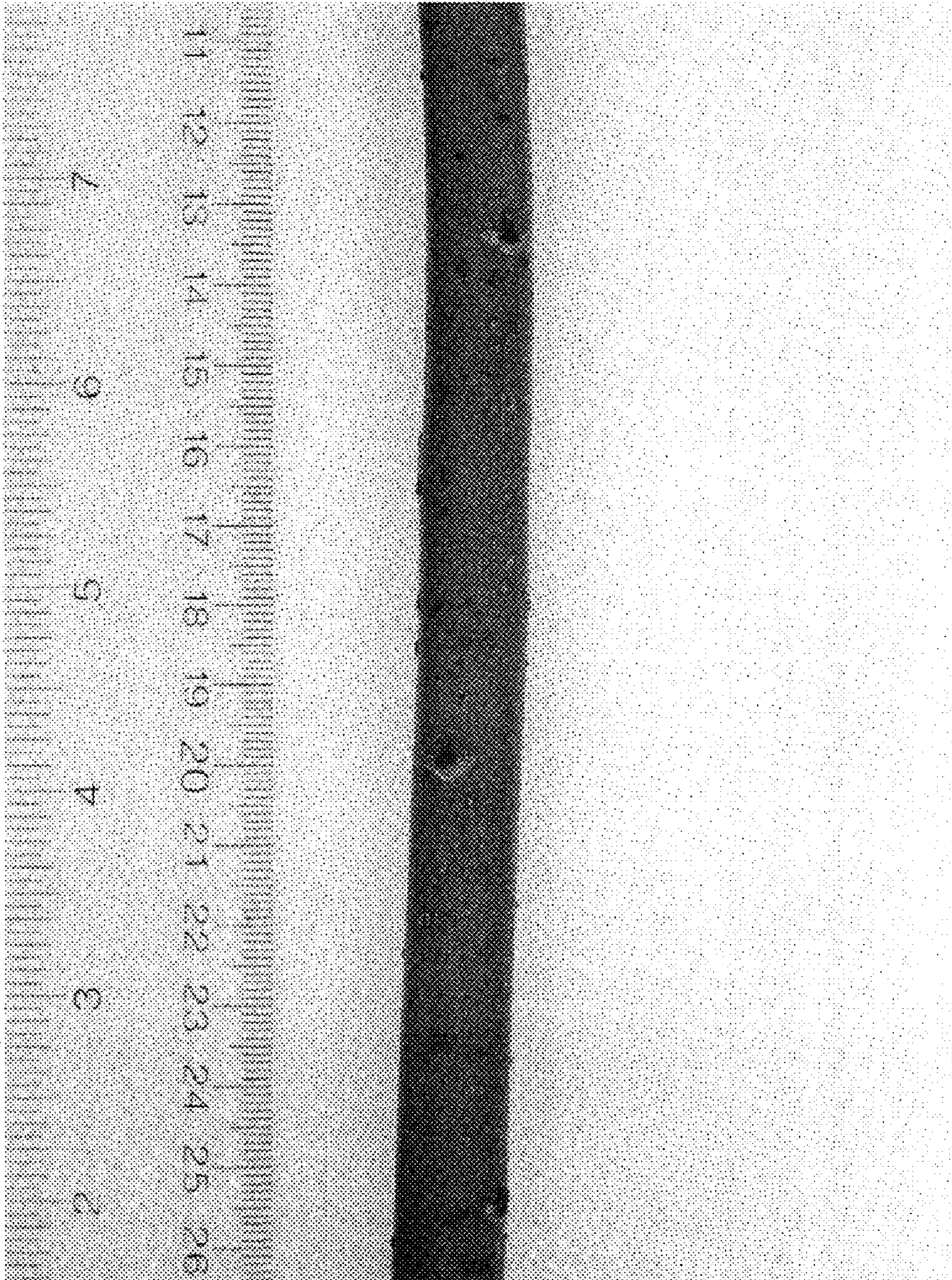


Fig. 1.2

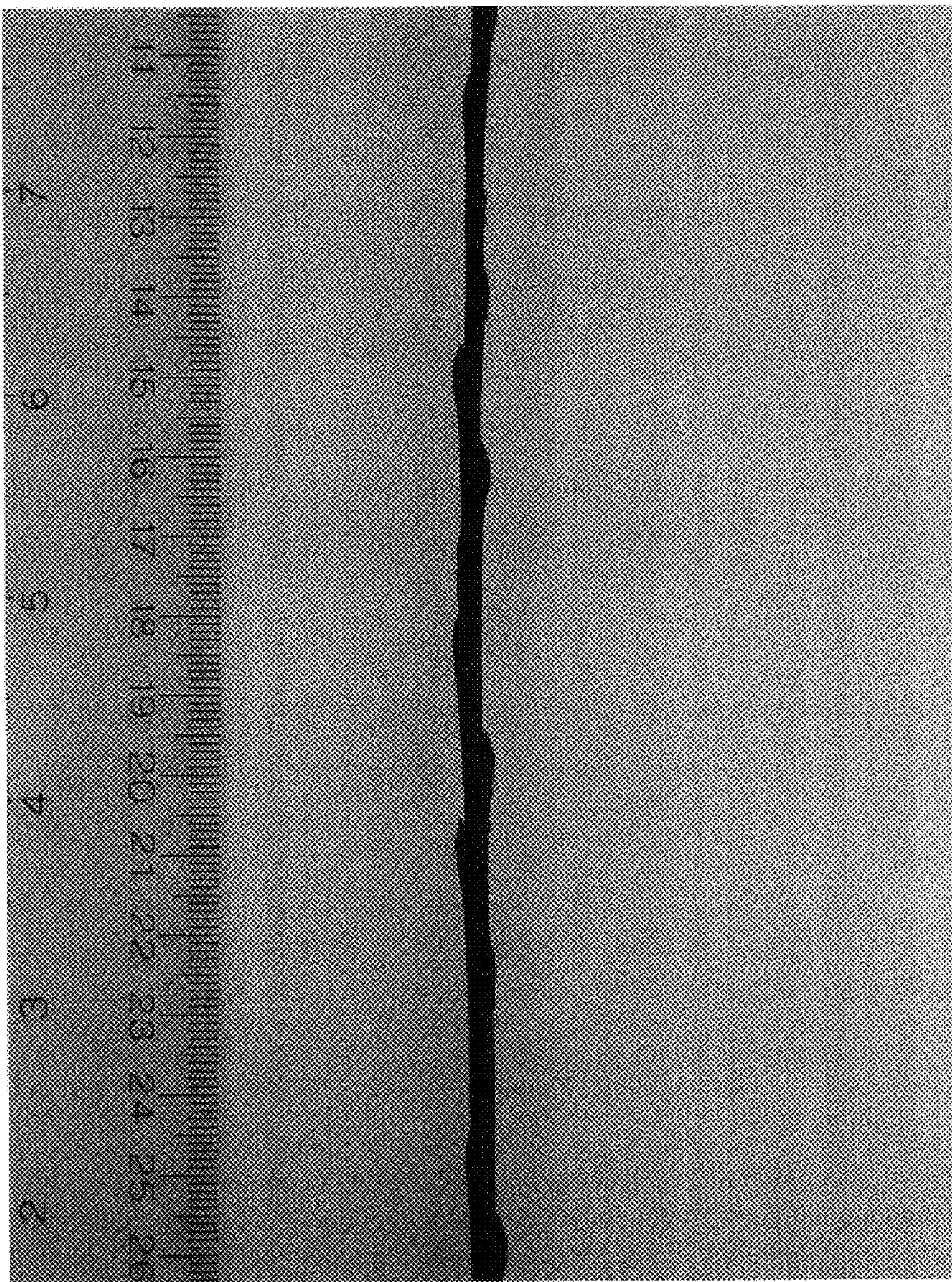


Fig. 13

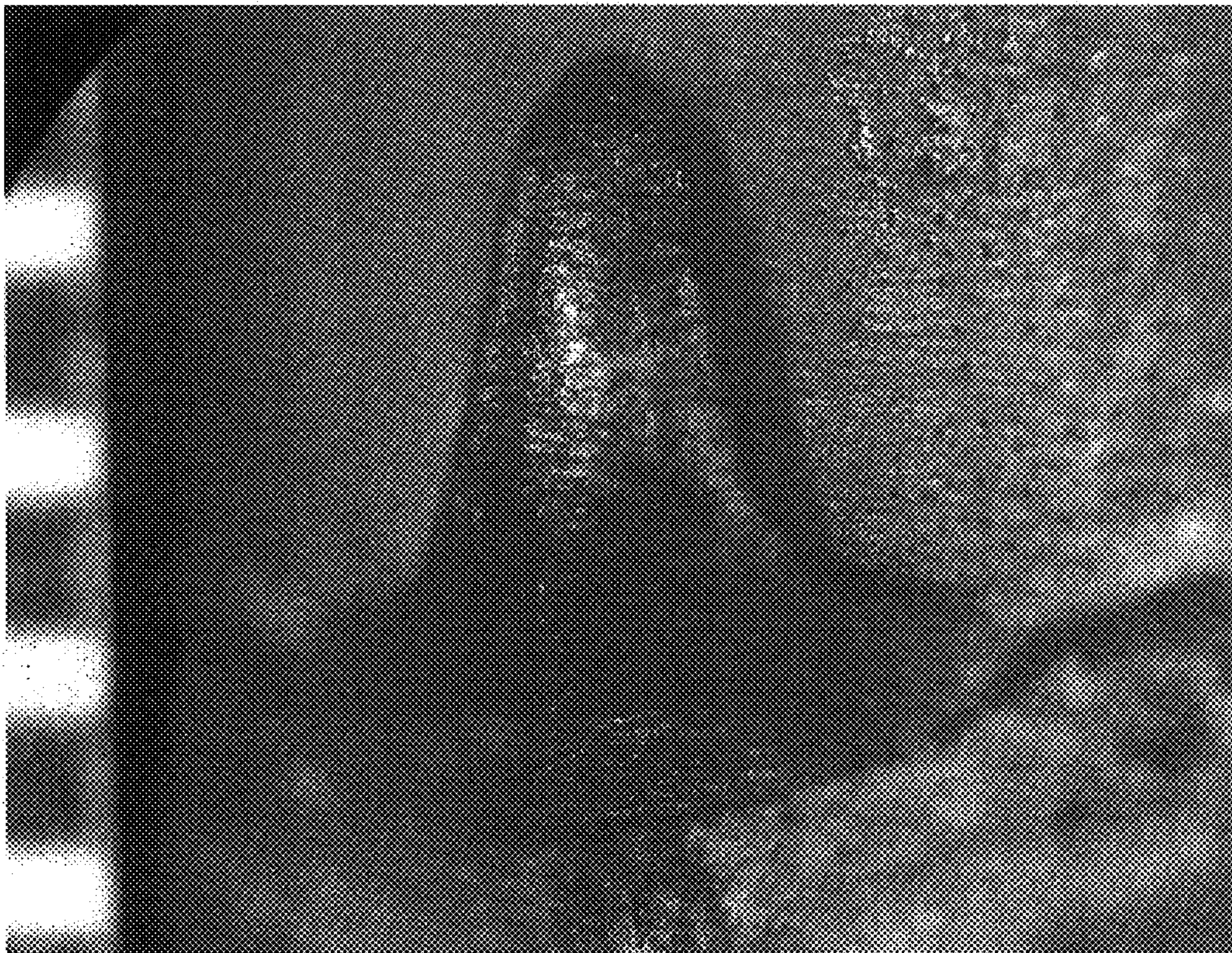


Fig. 1.4

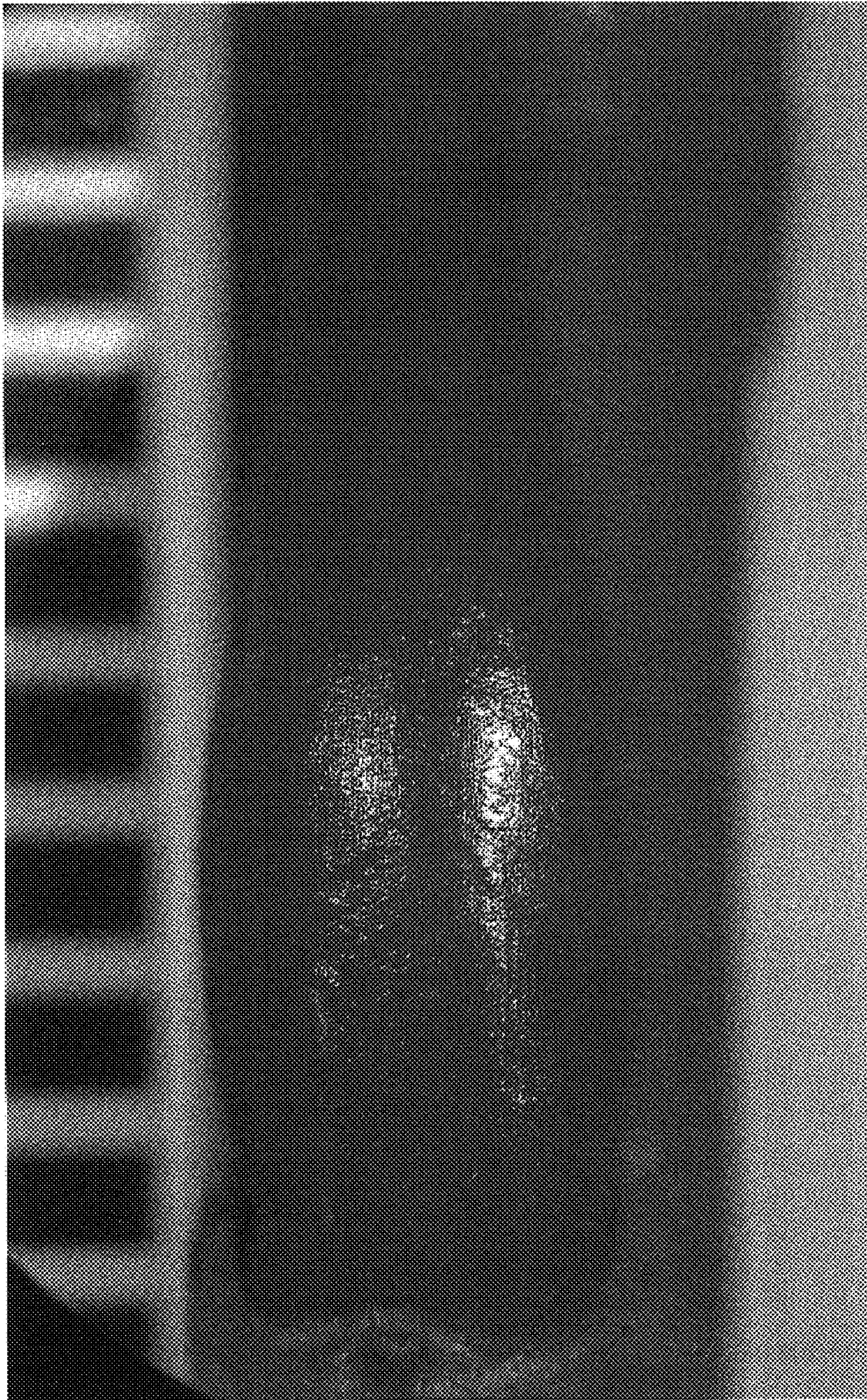


Fig. 1.5

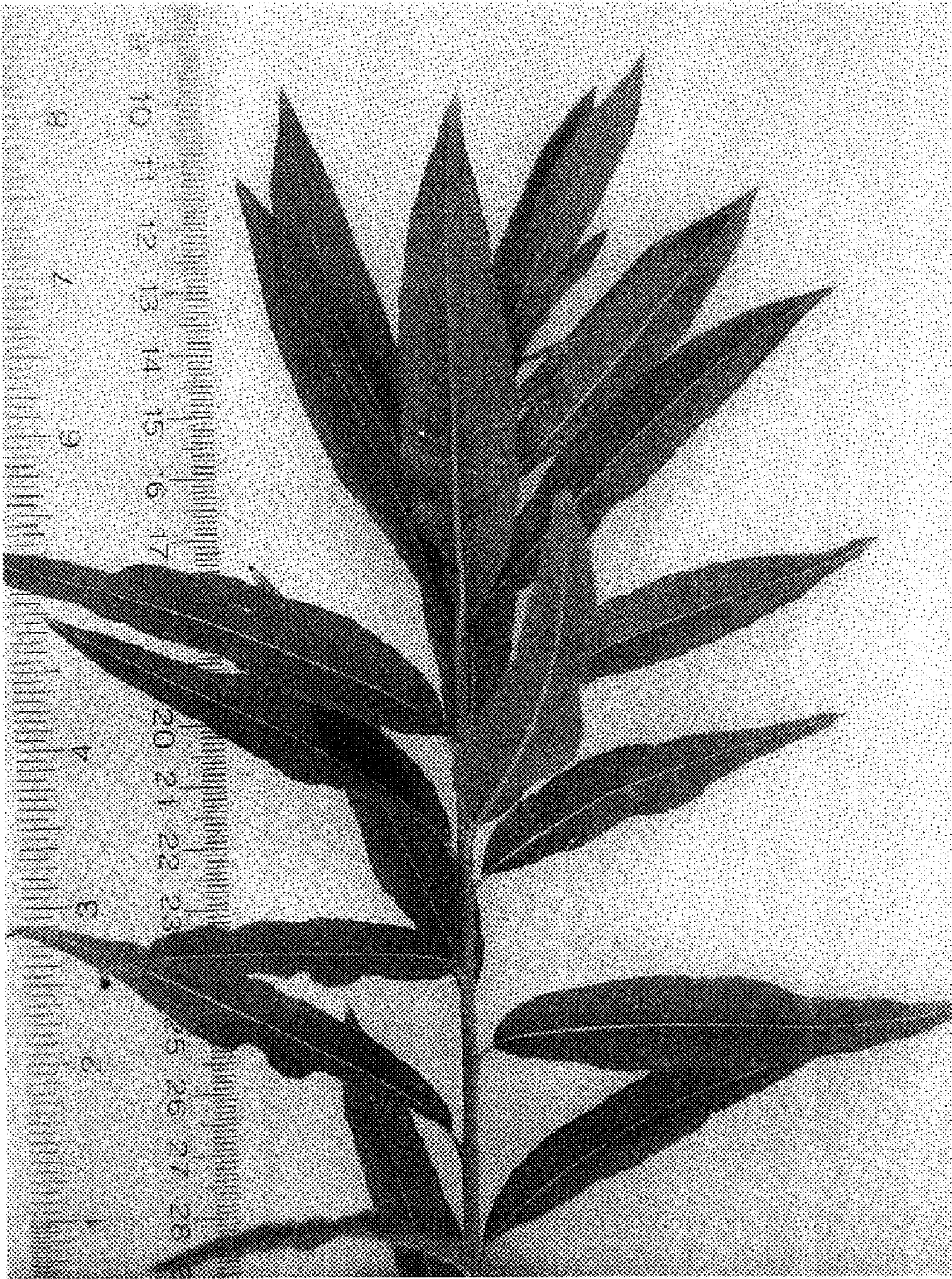


Fig. 1.6

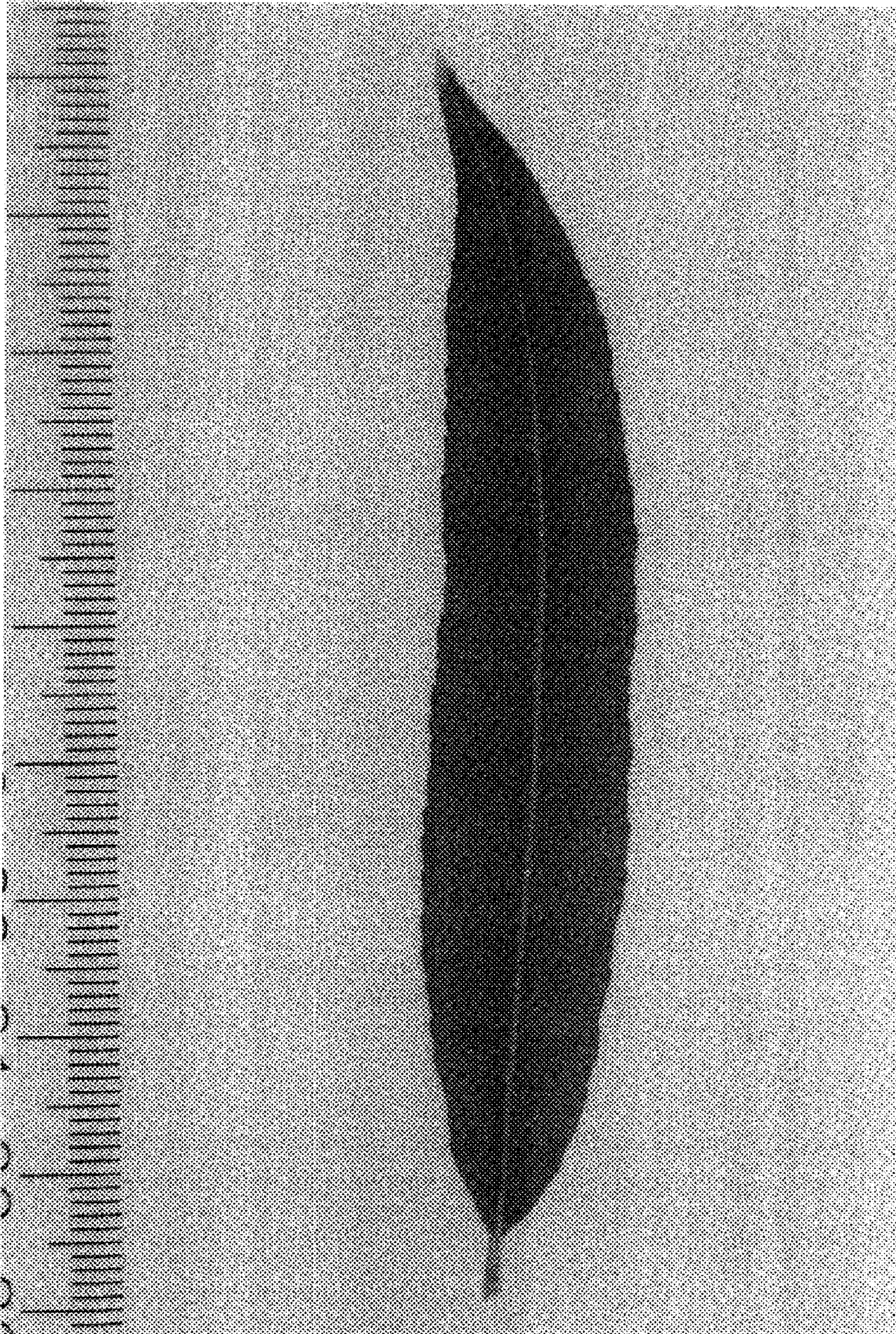


Fig. 1.7

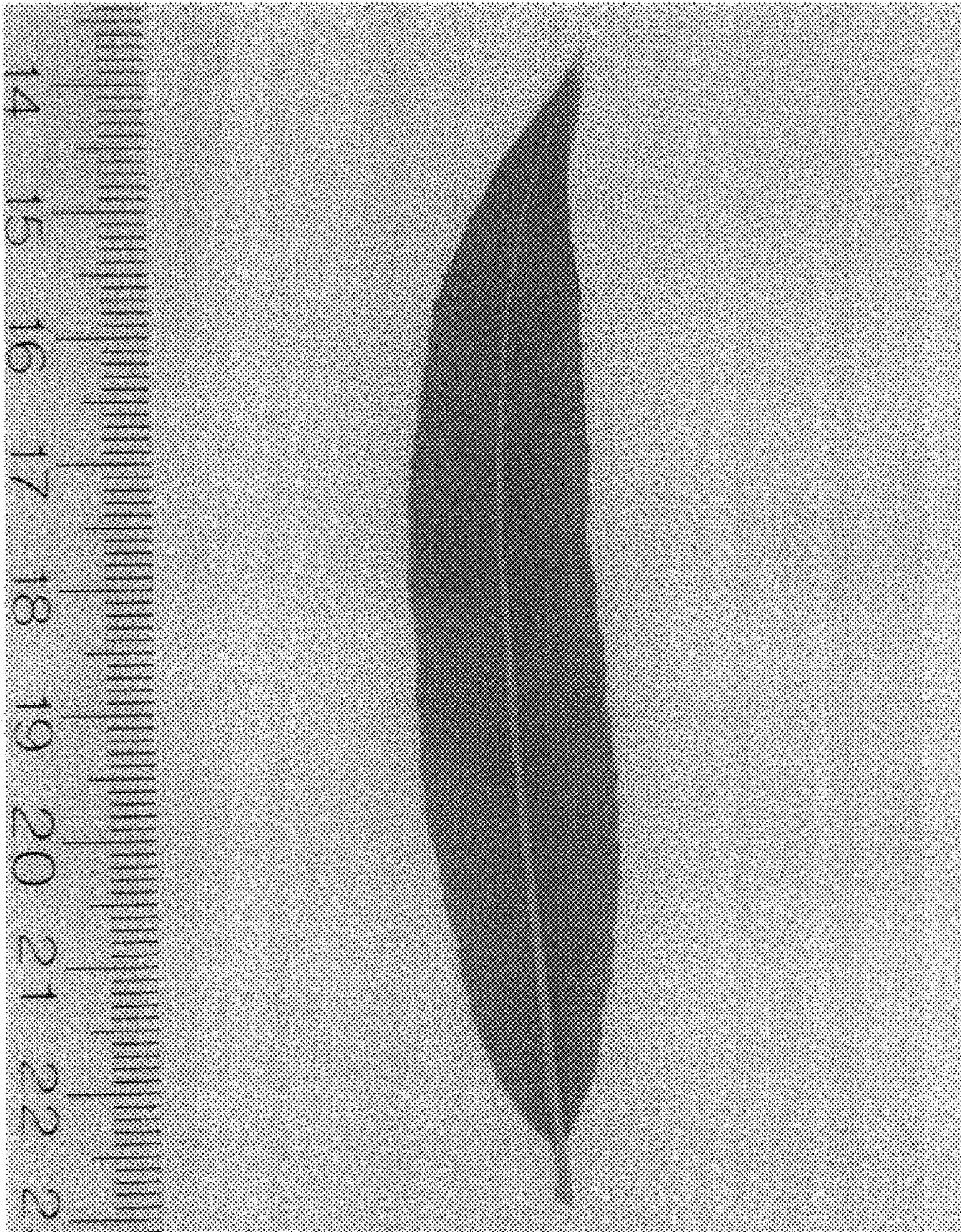


Fig. 1.8

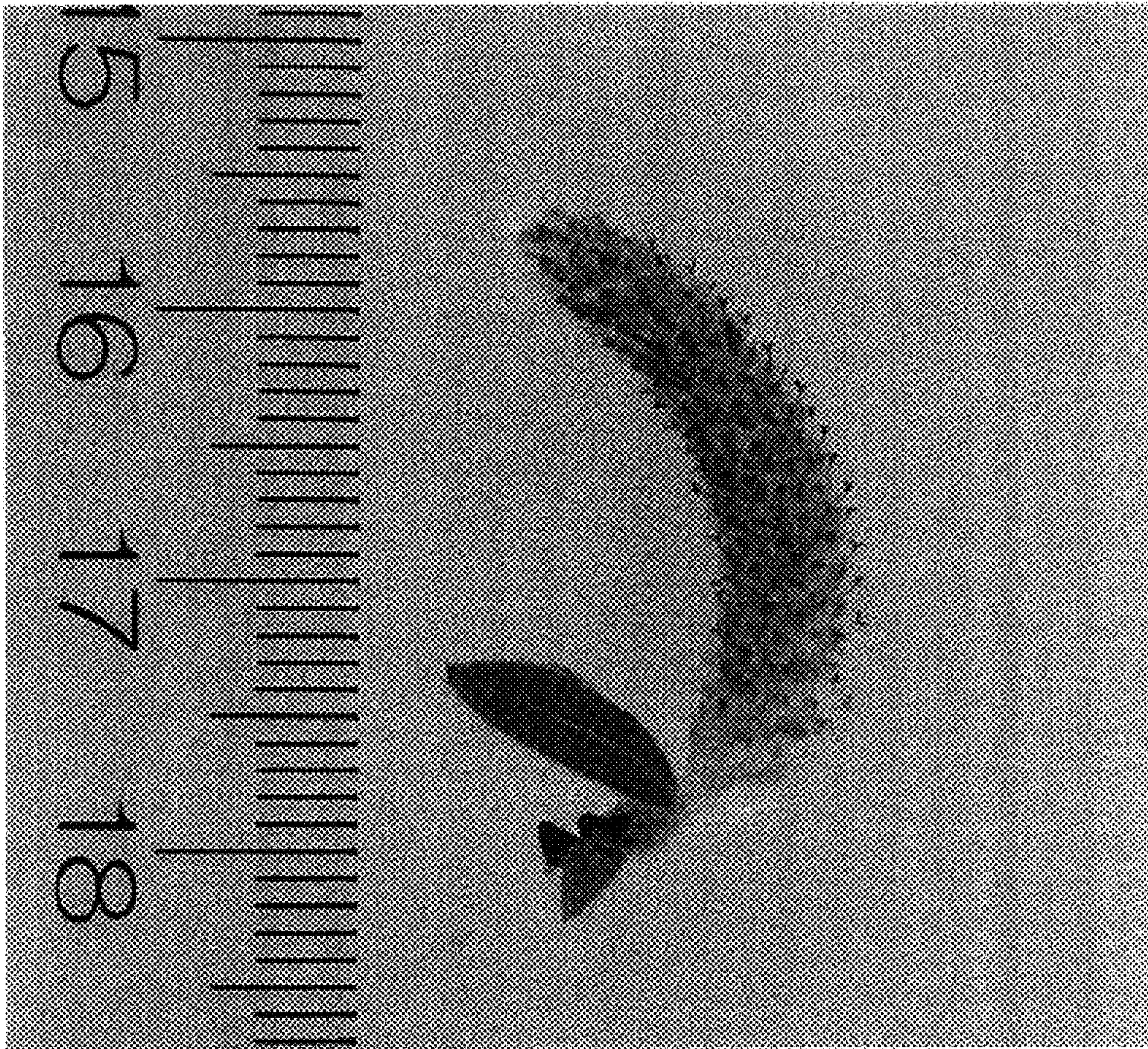


Fig. 19

