BRITISH STANDARD

BS 3823 : 1990

Specification for

Grading of ash and hickory wood handles for hand tools

Manches en bois de frêne et d'hickory pour outils à main. Méthode de classification

Klassifizierung von Holzgriffen aus Eschen- und Hickoryholz für Handwerkzeug

STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Machine, Engineers and Hand Tools Standards Policy Committee (MTE/-) to Technical Committee MTE/15, upon which the following bodies were represented:

British Coal Corporation
British Telecommunications plc
Consumer Policy Committee of BSI
Department of Trade and Industry (Mechanical Engineering and Manufacturing Technology Division (Mmt))
Electricity Supply Industry in England and Wales
Engineering Equipment and Material Users' Association
Federation of British Engineers' Tool Manufacturers
Federation of British Hand Tool Manufacturers
Handle Manufacturers' Association
Institute of Carpenters
Institution of Production Engineers
Ministry of Defence

The following body was also represented in the drafting of the standard, through subcommittees and panels:
Forestry Commission

This British Standard, having been prepared under the direction of the Machine, Engineers and Hand Tools Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 May 1990

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Foreword

This British Standard has been prepared under the direction of the Machine, Engineers and Hand Tools Standards Policy Committee and at the request of users and manufacturers of hand tools. It supersedes BS 3823 : Part 1 : 1965 which is withdrawn. In producing standards for tools which are provided with wood handles it has been customary to insert a requirement stating that the timber has to be well-seasoned, tough, straight grained; free from knots, shakes and other defects; and with a controlled moisture content at the time of manufacture. Such requirements have been criticized as being insufficiently indicative of the exact quality of material required, being too stringent in demanding theoretically perfect timber.

This British Standard provides criteria by which handles are accepted or rejected relative to grades and thus gives clearer definition on grading for the various hand tools standards which, where appropriate, will make reference to this document. In this way the fullest information will be available to inspectors of the tools and disputes on quality may be avoided.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Section one. General

1 Scope

This British Standard specifies criteria for use in grading handles intended for fitting to general purpose hand tools including agricultural and striking tools.

The scope covers only unbleached handles manufactured from natural ash (*Fraxinus excelsior* and *Fraxinus americana*) and from any of the four true species of hickory as follows:

shagbark hickory (*Carya ovata*);

shellbark hickory (*Carya laciniosa*);

pignut hickory (*Carya glabra*);

mockernut hickory (*Carya tomentosa*).

The standard specifies the requirements for freedom from defects and the permissible blemishes which are tolerable in respect of the various grades of handles.

A method for determining the grain slope and recommendations for storing wood handles are given in the appendices.

NOTE. The titles of the publications referred to in this standard are given on the inside back cover.

2 Definitions

For the purposes of this British Standard the definitions given in BS 6100 : Section 4.1 to Section 4.4 apply together with the following.

2.1 General terms

2.1.1 annual ring[1)]
A growth ring corresponding to an annual period of growth.

2.1.2 air-seasoning[1)]
The process of drying timber by exposure to natural atmospheric conditions.

2.1.3 blemish[1)]
Any feature that mars the appearance of timber or other material without affecting its technical quality.

2.1.4 conversion[1)]
The process of sawing timber from the log.

2.1.5 defect[1)]
Any feature that lowers the technical quality or commercial value of timber or other material and may therefore lead to its rejection or to its relegation to a lower grade.

2.1.6 density[1)]
The mass per unit volume, usually expressed in kilograms per cubic metre (or kg/m^3).

2.1.7 fabrication
Forming by any machining process, following conversion.

2.1.8 fibres[1)]
The long narrow elements (cells) of which wood and certain other plant tissues are largely composed.

2.1.9 grain[1)]
The general direction or arrangement of the fibres, e.g. spiral grain, straight grain.

2.1.10 kiln[1)]
A chamber used for seasoning and conditioning timber, in which the temperature and humidity of the circulating air can be suitably varied and controlled.

2.1.11 kiln-seasoning[1)]
The process of drying timber in a kiln.

2.1.12 moisture content.[1)]
The amount of moisture in timber or other material expressed as a percentage of its oven-dry weight.

2.1.13 seasoning[1)]
The process of drying timber to a moisture range appropriate to the conditions and purposes for which it is to be used.

2.1.14 sound[1)]
Free from decay.

2.1.15 straight grain[1)]
Grain which follows a course generally parallel to the longitudinal axis of the piece.

2.2 Natural defects, blemishes and imperfections

2.2.1 abrupt dipped grain
Local deviation of the grain from its general direction of more than 5 mm over a distance not greater than 100 mm.

2.2.2 bird-peck[1)]
A small hole or patch of distorted grain, sometimes associated with discoloration, attributed to the action of birds.

2.2.3 blackheart[1)]
An abnormal black or dark brown discoloration which may occur in the heartwood of certain timbers. Not necessarily associated with decay.

2.2.4 brashness[1)]
A condition that causes wood to be relatively low in shock resistance (brittle). Under load, brashy wood fails abruptly at comparatively small deflexions with little or no splintering.

2.2.5 curly grain[1)]
Grain occurring in irregular curves, qualified as slight, medium or severe curly grain (see figure 2).

2.2.6 decay[1)]
Decomposition by fungi and other micro-organisms resulting in softening, progressive loss of strength and weight and often a change of texture and colour.

[1)] Repeated from BS 6100 : Section 4.1.

2.2.7 flecks[1]
Small spots, dapples, or marks caused by rays or other anatomical features, local irregularities in the grain or natural deposits of gummy or mineral matter.

2.2.8 heavy stain
Pronounced discolorations, predominantly blue, occurring in specks, spots, streaks and patches.

2.2.9 knot[1]
A portion of a branch enclosed in the wood by the natural growth of the tree.

2.2.10 large streaks
Lines of discoloration greater than 1 mm wide extending along the grain.

2.2.11 light stain
Slight discolorations of any colour other than the natural colour of the wood, which do not impair the appearance of the handle.

2.2.12 medium streaks
Lines of discoloration greater than 1 mm wide extending along the grain for more than one-third of the length of the handle.

2.2.13 pin knot[2]
A knot 6 mm or less in diameter.

2.2.14 pin twig knot
A knot less than 3 mm in diameter.

2.2.15 pin twig mark
A mark (usually the termination of a pin twig knot) less than 2 mm in diameter.

2.2.16 pith[1]
The central core of a stem consisting chiefly of parenchyma or soft tissue.

2.2.17 shake[1]
A separation of the fibres along the grain due to stresses developing in the standing tree, or in felling or in seasoning.

2.2.18 slight dipped grain
Local deviation of the grain from its general direction, of not more than 5 mm over a distance not greater than 100 mm.

2.2.19 sloping grain (diagonal grain)[1]
Grain which is at an angle to the longitudinal axis of the piece, owing to the method of conversion.

2.2.20 small streaks
Threadlike lines of discoloration extending along the grain for not more than one-third of the length of the handle.

2.2.21 sound knot[1]
A live knot free from decay, solid across its face, and at least as hard as the surrounding wood. See **2.2.24**.

2.2.22 spiral grain[1]
Grain which follows a spiral course in one direction around the stem.

2.2.23 stain[1]
Discoloration or variation from natural colour due to fungi, chemical action or other causes.

2.2.24 unsound knot[1]
A knot not solid across its face or softer than the surrounding wood due to decay or other defects. See **2.2.21**.

2.2.25 wavy grain[1]
Grain in fairly uniform waves or ripples, qualified as slight, medium or severe wavy grain (see figure 1).

2.2.26 worm[1]
Any wood-boring organism (chiefly insects but including marine borers) that attacks wood, producing holes or tunnels or similar damage.

2.2.27 wormhole[1]
A hole or tunnel, irrespective of size, caused by worm.

2.3 Defects, blemishes and imperfections introduced in seasoning, conversion and fabrication

2.3.1 case-hardening[1]
The condition existing in timber in which the outer layers have undergone some drying and become set without corresponding shrinkage, causing stress between the inner and outer layers.

2.3.2 chip-marks[1]
Indentations on the finished surface of timber made by chip fragments that have been carried round on the planing knife edges from the preceding cut. They may also be caused by chips being impressed by the rollers or pressure guides of a planning machine.

2.3.3 collapse[1]
Flattening or buckling of the wood elements during drying which becomes manifest in excessive and/or uneven shrinkage.

2.3.4 failure to clean up
The unmachined surface area on a handle not completely formed in machining.

2.3.5 machine burn[1]
Darkening or charring of wood due to excessive friction during conversion or machining.

2.3.6 split[1]
A separation of the fibres along the grain forming a crack or fissure that extends through the piece from one surface to another.

2.3.7 torn grain[1]
Tearing of the wood below the finished surface by the action of a cutter or other tool.

2.3.8 twist[1]
Spiral distortion.

[1] Repeated from BS 6100 : Section 4.1.
[2] Repeated from BS 6100 : Section 4.3.

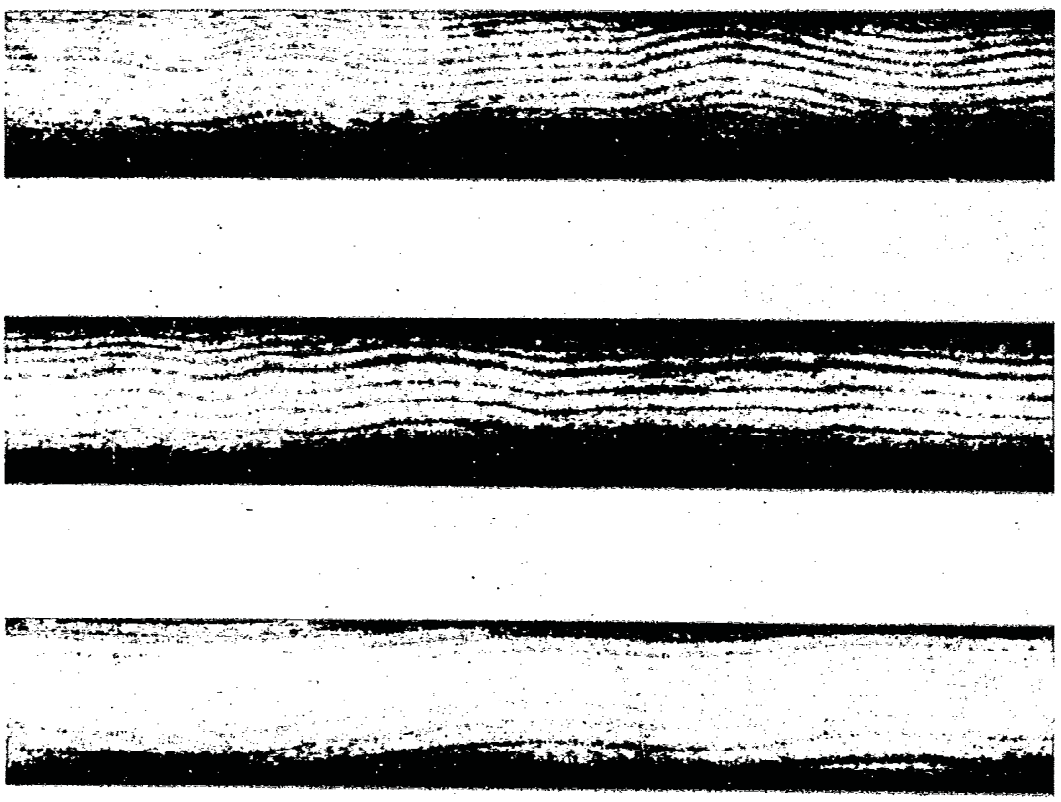


Figure 1. Illustration of wavy grain: half size

2.3.9 woolly grain[1)]
The condition of a machined surface on which the fibres have been dragged up by the cutter instead of being cut cleanly.

3 General

All grades of handles shall be subject to the following.

(a) The handles shall be properly air-seasoned or kiln-seasoned and apart from the permissible defects, blemishes and imperfections listed in respect of each grade, shall be sound and free from detrimental defects arising from the following causes:

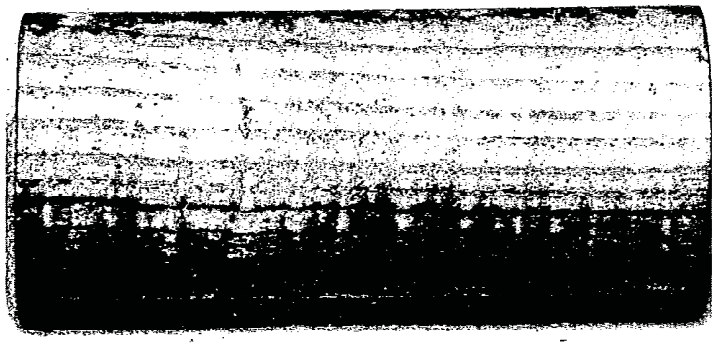
(1) natural defects, blemishes and imperfections (see **2.2**);

(2) defects, blemishes and imperfections introduced in seasoning, conversion and fabrication (see **2.3**).

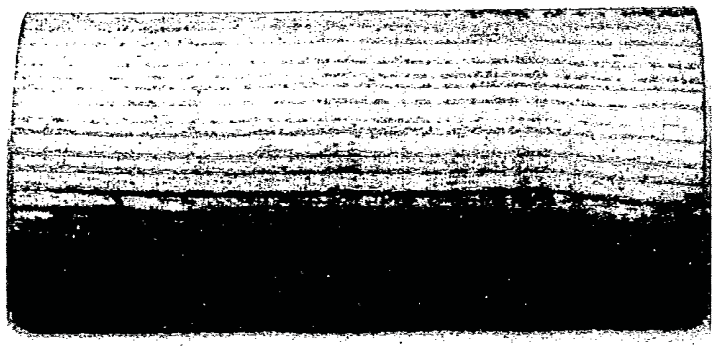
(b) Handles shall be finished smooth and free from any projection or defect which may be injurious to the hands.

(c) When measured in accordance with appendix A the grain of each handle shall be generally straight, or diagonal within the limits and permissible variations specified relative to each grade.

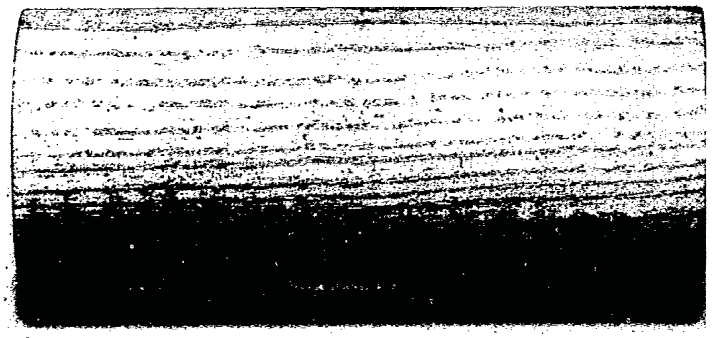
[1)]Repeated from BS 6100 : Section 4.1.



Severe



Medium



Slight

Figure 2. Illustration of curly grain: full size

Section two. Grading

4 Ash non-striking tool handles

The handles shall be graded in accordance with the following.

(a) *Density.* The density of the material shall be determined at the time of manufacture. The density, determined at a moisture content of not less than 14 % and not greater than 16 %, shall be not less than the following.

Grade A handles: 670 kg/m^3 (42lbs/ft^3)

Grade B handles: 610 kg/m^3 (38lbs/ft^3)

Grade C handles: 510 kg/m^3 (32lbs/ft^3)

(b) *Annual rings.* The number of annual rings per 25 mm of radius shall be within the following ranges.

	Min.	Max.
Grade A handles:	5	16
Grade B handles:	4	16
Grade C handles:	4	16

(c) *Sloping grain.* The general direction of the grain shall not deviate by more than the limits given in tables 1 and 2 when measured in accordance with appendix A.

(d) *Permissible blemishes.* The number of blemishes permitted in any one handle, or defined length of handle; their dispersal and disposition shall be given in table 3.

(e) *Colour.* The colour requirements for grades A and B shall be as follows.

Grade A handles: white, light brown, or light red, or a mixture of white, light brown and light red which shall blend uniformly.

Grade B handles: white, or white with the remainder light brown, light red, red, or brown, or a mixture of these colours which blend uniformly.

Grade C handles: no limitation.

NOTE. Apart from the requirements stated for grades A and B coloration should not be regarded as grading criteria unless stated in the order or contract.

5 Ash striking tool handles up to and including 425 mm in length

The handles shall comply with the following.

(a) *Density.* The density, determined at a moisture content of not less than 14 % and not greater than 16 %, shall be not less than 610 kg/m^3.

(b) *Annual rings.* The number of annual rings per 25 mm of radius shall be not less than 5 and not more than 16.

(c) *Sloping grain.* The general direction of the grain shall not deviate from the longitudinal axis of the handle by more than 25 mm in 500 mm when measured in accordance with appendix A.

(d) *Permissible blemishes.* The number, dispersal and disposition blemishes in any one handle shall be as given in table 4.

(e) *Colour.* See item (e) of clause 4.

6 Ash striking tool handles greater than 425 mm in length

The handles shall comply with the grade A requirements of clause 5 except that not more than one blemish shall be permissible to any one handle.

7 Hickory striking tool handles up to and including 1050 mm in length

The handles shall be graded in accordance with the following.

(a) *Density.* The density of the material shall be determined at the time of manufacture. The density determined at a moisture content of not less than 14 % and not greater than 16 % shall be not less than the following.

Grade AW handles: 770 kg/m^3 (48lbs/ft^3)

Grade AR handles: 770 kg/m^3 (48lbs/ft^3)

Grade BW handles: 670 kg/m^3 (42lbs/ft^3)

Grade BR handles: 670 kg/m^3 (42lbs/ft^3)

(b) *Annual rings.* The maximum number of annual rings per 25 mm of radius shall be in accordance with the following.

Grades AW and AR handles: 22

Grades BW and BR handles: 27

(c) *Sloping grain.* The general direction of the grain shall not deviate from a course generally parallel to the longitudinal axis by an amount greater than half the width of the handle waist over a distance of one-third of the overall length of the handle measured from the eye end. Over

Table 1. Sloping grain deviations for handles of 450 mm to 1050 mm in length

Grade	Maximum deviation from longitudinal axis	Disposition of deviation
A	Equal to half diameter of handle	In full length
B	Equal to two-thirds diameter of handle	In any 500 mm of full length
C	Equal to diameter of handles	In any 380 mm of full length

the remaining length of handle the continuation of this deviation shall be not greater than two-thirds the greatest diameter and shall not run out in the full length of the handle.

(d) *Permissible blemishes.* The number, dispersal and disposition of blemishes and defects shall be given in table 5.

(e) *Colour.* When colour requirements form part of an agreed order or contract the following colour identification code shall be used.

Grade AW handles: all white, except for permissible blemishes.

Grade AR handles: red or red and white.

Grade BW handles: white, with red extending from the eye end not more than one-third the total length, or extending from the grip end not more than one-third the total length.

Grade BR handles: no limitation.

Table 2. Sloping grain deviations for handles above 1050mm in length

Grade	Maximum deviation from longitudinal axis	Disposition of deviation	
		Measured from grip end	Remainder of handle length
A	Equal to half diameter of handle	Equal to one-third total length	Equal to two-thirds total length
B	Equal to two-thirds diameter of handle	Equal to one-third total length	Equal to two-thirds total length
C	Equal to full diameter	Equal to one-third length	In any 500 mm of total length

Table 3. Permissible blemishes in ash non-striking tool handles

Grade	Type of blemish	Number, dispersal and disposition		
		Number	Dispersed over	Minimum spacing between specific types of blemishes
A	Slight dipped grain	1	Full length	
	Pin twig marks	1	Any 500 mm	300 mm
	small streaks	1	Any 500 mm	300 mm
B	Slight dipped grain	2	Any 500 mm	150 mm
	Pin twig knots	2	1 at each end of handle	
	Pin twig marks	4	Any 500 mm	150 mm
	Large streaks	2	Any 500 mm	150 mm
	Slight and medium wavy or curly grain	Not limited	Not limited	Not limited
C	Abrupt dipped grain	Not limited	Not limited	Not limited
	Pin knots	2	1 at each end of handle	
	Pin twig knots	Not limited	Not limited	Not limited
	Streaks	Not limited	Not limited	Not limited
	Slight, medium and severe wavy or curly grain	Not limited	Not limited	Not limited
	Failure to clean up	None	None	None

Table 4. Permissible blemishes in ash striking tool handles up to and including 425 mm

Grade	Type of blemish	Number, dispersal and disposition		
		Number	Dispersed over	Minimum spacing between specific types of blemishes
A	Slight dipped grain	1	Half length of handle measured from grip end	50 mm
	Pin twig marks	1		
	Small streaks	1		
B	Abrupt dipped grain	1	Half length of handle measured from grip end	50 mm
	Pin twig marks	Not limited		50 mm
	Medium streaks	2	Anywhere in full length of handle	

Table 5. Permissible blemishes in hickory striking tool handles up to and including 1050 mm

Grade	Type of blemish or defect	Number, dispersal and disposition		
		Number	Dispersed over	Minimum spacing between specific or defects
AW and AR	Light stains		Not exceeding approximately one-tenth of the total area of handle	
	Medium streaks	4[1)]	Total length of handle	Not limited
	Slight dipped grain	1	Total length of handle	—
BW and BR	Bird-pecks	4	Two-thirds of length from grip end	75 mm
	Pin knots	4	Two-thirds of length from grip end	75 mm
	Large streaks	Not limited	Total length of handle	—
	Light stain	Not limited	Total of handle	—
	Heavy stains	Not limited	Anywhere except in the central one-third of total length	—
	Slight dipped grain	Not limited	Total length of handle	—

[1)] The equivalent in small streaks may alternatively be accepted.

8 Marking

Handles graded in accordance with this British Standard shall be marked or labelled with the following information.

(a) The number of this British Standard, i.e. BS 3823[1)] shall be marked on all replacement handles.

NOTE. When handles are fitted to products already covered by a British Standard this marking is not obligatory.

(b) The type of timber used in manufacture, i.e. ash or hickory.

(c) The appropriate grade.

(d) A traceability mark to determine source of manufacture.

9 Moisture content

All handles supplied in accordance with this British Standard shall have a moisture content of 16 % maximum and 10 % minimum at time of supply.

[1)] Marking BS 3823 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendices

Appendix A. Determination of slope of grain

A.1 Apparatus

A.1.1 *Scribe*, comprising a cranked rod with a swivel handle and a needle, at the tip, set to a slight trailing angle (see figure 3).

A.2 Procedure

A.2.1 Press the needle into the wood and draw the scribe along with a steady action in the apparent direction of the grain, which is indicated more precisely as the needle forms a groove (see figure 4).

NOTE 1. If the pressure on the needle is insufficient it may be dragged across the grain; however, a steady action is impossible if the pressure is excessive and the needle penetrates too far into the wood.

NOTE 2. If the action is correct the needle should follow the grain even when the direction of pull is slightly out of line.

A.2.2 Check that the scribe does follow the grain by scribing another groove in close proximity on each side of the original one with the direction of pull diverging slightly outwards in each case.

NOTE. If the grooves are following the grain they will be parallel to each other.

A.2.3 Measure the grain inclination on a face (see figure 5) in which AB is the line indicating grain direction, AC is a line drawn parallel to the edge of the member, BC is of length one unit (any convenient unit may be used) and is at right angles to AC.

A.2.4 Express the grain inclination as 'one in x', where x is the length of AC measured in terms of BC.

Appendix B. Recommendations for storing wood handles

Handles should be stored in a cool dry place, preferably with humidity control. They should not be exposed to bright sunlight and should be placed horizontally in racks to avoid warping. Storage should be so arranged that stocks are used in rotation according to age; the oldest being used first.

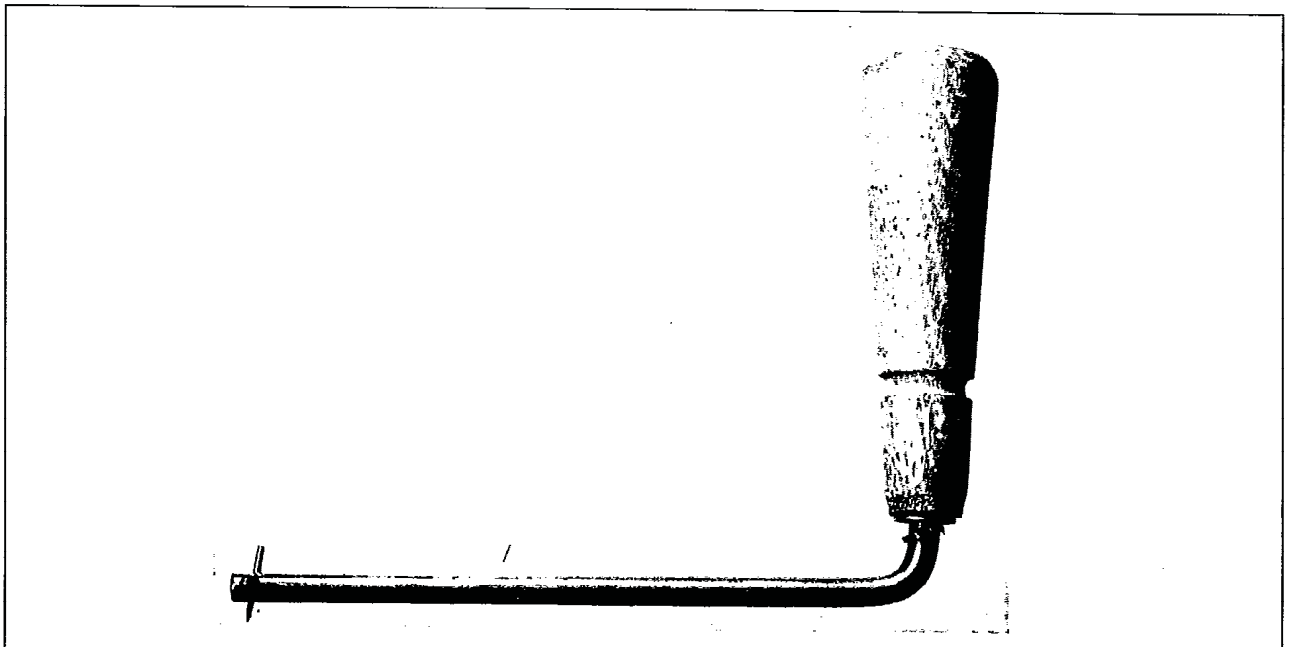


Figure 3. Swivel-handled scribe for determination of slope of grain in wood

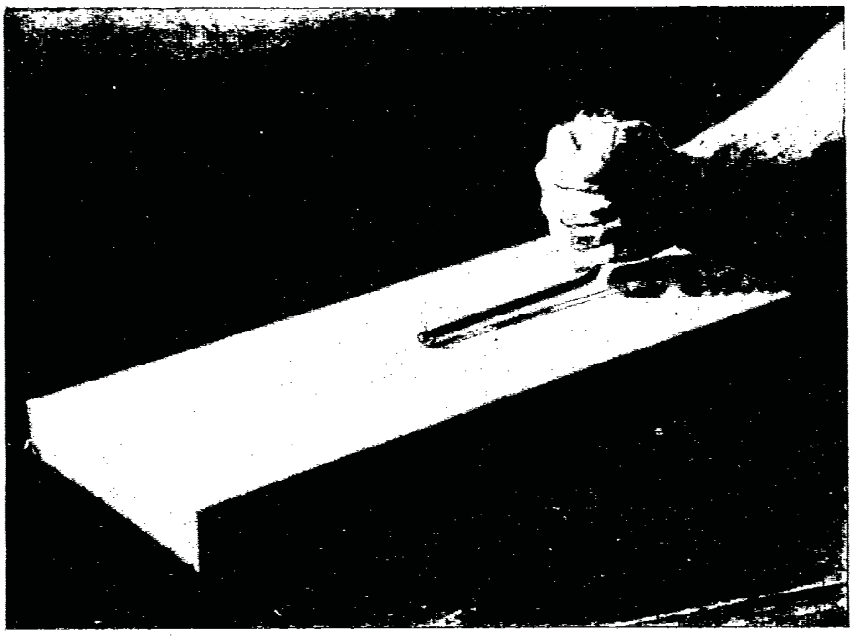


Figure 4. Use of scribe

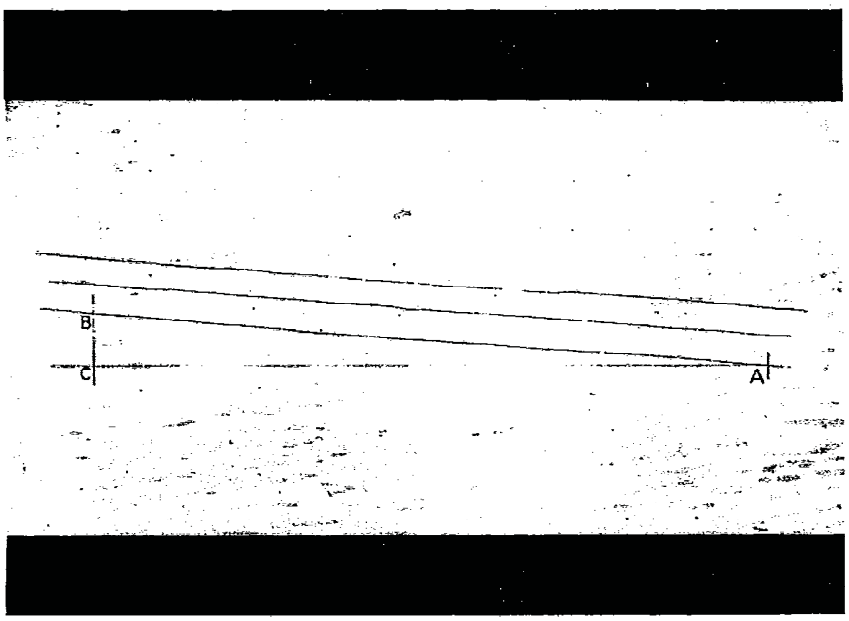


Figure 5. Measurement of slope of grain

Publications referred to

BS 6100 Glossary of building and civil engineering terms
Section 4.1 Characteristics and properties of timber and wood based panel products
Section 4.2 Sizes and quantities of solid timber
Section 4.3 Wood based panel products
Section 4.4 Carpentry and joinery

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