

FIRE TESTS WITH DOORS.

A 2-in. FRAMED AUSTRIAN OAK DOOR,
WITH 2-in. SOLID PANELS.

A 2-in. FRAMED AMERICAN WALNUT DOOR,
WITH 2-in SOLID PANELS.

Particulars OF EXPERIMENTAL FIRE TESTS.

ALL RIGHTS RESERVED.

LONDON, 1900.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded, 1807—Incorporated, 1899),

1, WATERLOO PLACE, PALL MALL.

Two Shillings and Sixpence.

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No. 34.—EXPERIMENTAL FIRE TESTS WITH FLOORS (R).
No. 35.—EXPERIMENTAL FIRE TESTS WITH DOORS (S AND T).
No. 36.—OFFICIAL FIRE TESTS WITH TREATED WOOD (No. 9).



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OBJECTS OF THE COMMITTEE.

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account intended to read as expressions of opinion, criticisms, or comparisons.

NOTE.

Again a report is presented dealing with doors, the materials used in this case being Austrian oak and American walnut respectively.

This report should of course be studied in connection with those dealing with similar door tests, and particularly with the one embodied in Publication No. 26, where the materials used were American oak and Moulmein teak.

EDWIN O. SACHS.

March 2nd, 1900.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*



Fig. G. VIEW OF DOORS BEFORE TEST (FROM OUTSIDE).

EXPERIMENTAL FIRE TESTS

CONDUCTED BY THE EXECUTIVE

OF THE

British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

FIRE TESTS, X AND Y, NOV. 15TH, 1899.

X.—A 2-in Framed Austrian Oak Door, with 2-in.
Solid Panels.

Y.—A 2-in. Framed American Walnut Door, with
2-in. Solid Panels.

OBJECT OF TEST.

To record the effect of a fierce fire of one hour, gradually increasing to a temperature of 2,000° Fahr.

Note.—The fire was to be applied from one side, and the doors were to open inwards on to the fire side.

Note.—The door openings were to be approximately 3 ft. 3 in. by 6 ft. 9 in.

SUMMARY OF EFFECT.

OAK DOOR.

In 33 minutes flame appeared through top of east top panel, between rail and panel.

In 45 minutes lower west panel fell out.

In 51 minutes upper panels and muntin and top rail fell out.

In 55 minutes remaining portion of door collapsed.

WALNUT DOOR.

In 15 minutes flame appeared at intervals over top rail, west side.

In 36 minutes flame between joint top west panel and top rail.

In 42 minutes flame through joint between top muntin and upper east panel.

In 58 minutes door collapsed.

DESCRIPTION OF TESTING PLANT.

(See Figs. A, B, C and D).

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 2 Hut.

The chamber was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 10 ft. internally. The ceiling of the hut was 9 ft. 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire clay.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, as shown.

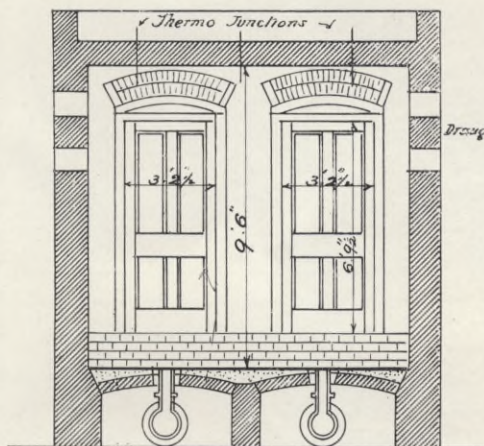
Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4; points 2 and 3 being outside the door, and the others on the fire side of doors. A continuous record was also taken from point No. 5.

There were observation holes in the east and west walls, closed by moveable iron shutters.

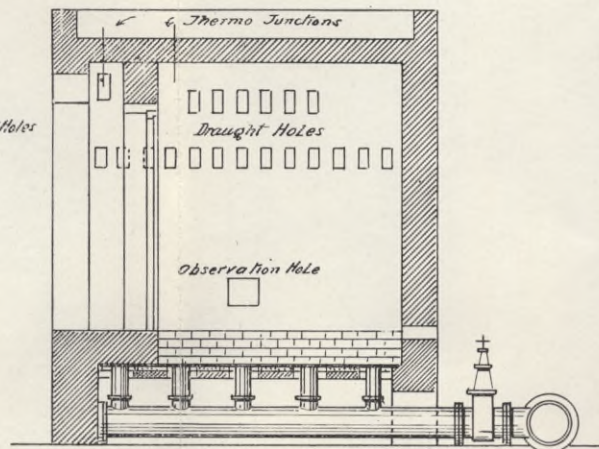
The draught holes were in the east and west walls.

The photographs were partly taken by daylight and partly by flash-light.

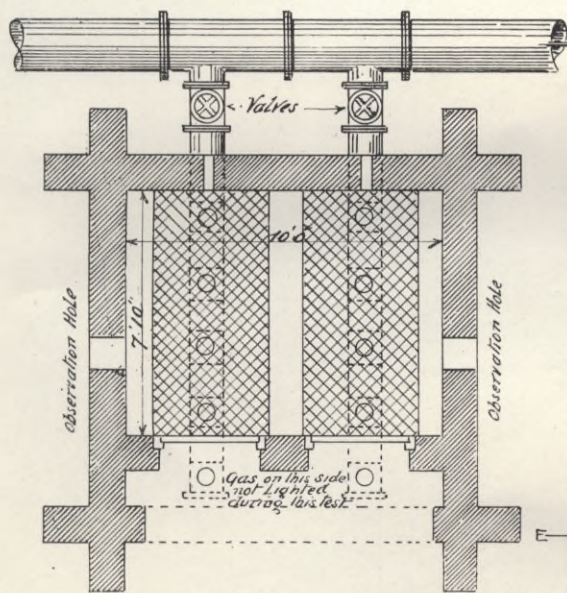
A brick wall 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from east to west. It was built 15 in. back from the main



SECTION LOOKING NORTH

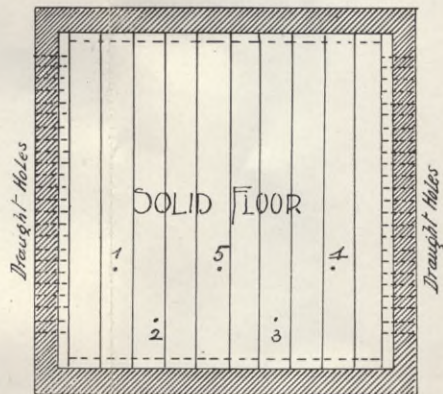


SECTION LOOKING EAST.

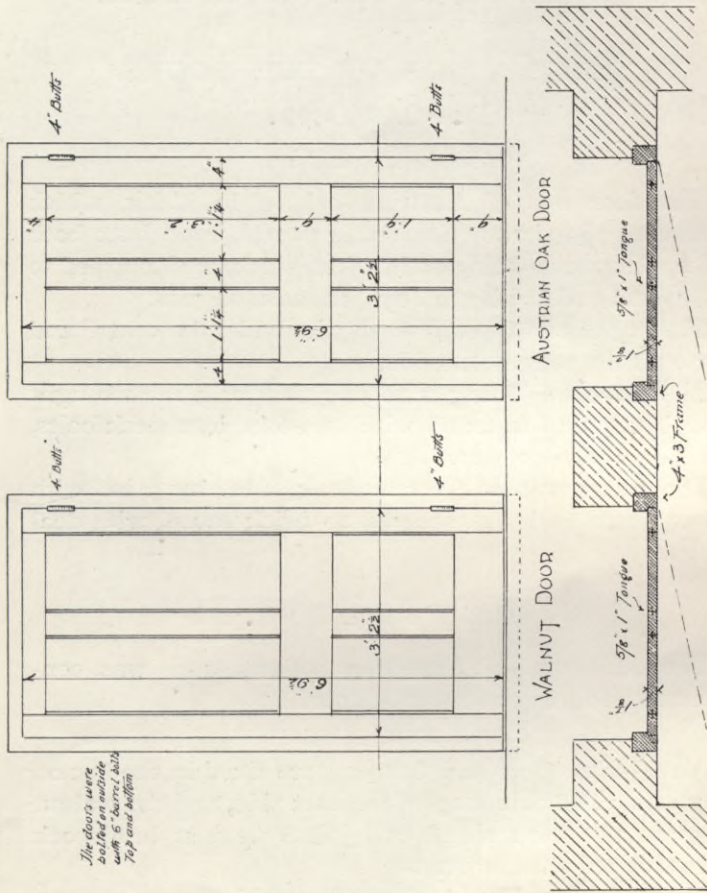


PLAN OF HUT.

To Gas Producer
 Note. Points marked 1. 2. 3. 4. 5
 are Thermo Junctions attached
 to wires leading to Pyrometers
 that marked 5 is self recording



PLAN OF ROOF



DETAILS OF DOORS, Figs. E and F.

wall. The wall was carried up to the ceiling, the height between floor and ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

CONSTRUCTION OF THE DOORS.

THE OAK DOOR.

(See Figs. E and F.)

The door was of Austrian oak, 2 in. thick, which measured $1\frac{7}{8}$ in. when finished, 4 panels, bead butt both sides, the panels being solid $1\frac{7}{8}$ in. thick, and tongued to styles and rails with 1 in. by $\frac{5}{8}$ in. oak tongues.

The styles and top rail were 5 in. wide, the centre and bottom rails were 9 in. wide.

The door was hung with one pair of 4 in. wrought iron butts, and fastened with two 6 in. iron neck bolts, fixed on outside of door.

The frame was of Austrian oak, 4 in. by 3 in. with $\frac{1}{2}$ in. rebate and was secured to brick reveal with deal plugs.

THE WALNUT DOOR.

The door was of American walnut, and was constructed and hung as the oak door.

Note.—The doors and frames were fixed in the hut on July 4th. The oak door on the east side, and the walnut door on the west side. All joints against brickwork were stopped with mortar.

The doors stood 12 in. above floor of hut.

PREPARATION FOR TEST.

On the afternoon of November 15th photographs were taken of the two doors from the outside. (See Fig. G.)

THE TEST.

(See Figs. 1 to 12, and H to M).

On November 15th the test was undertaken. The following is the log of the test.

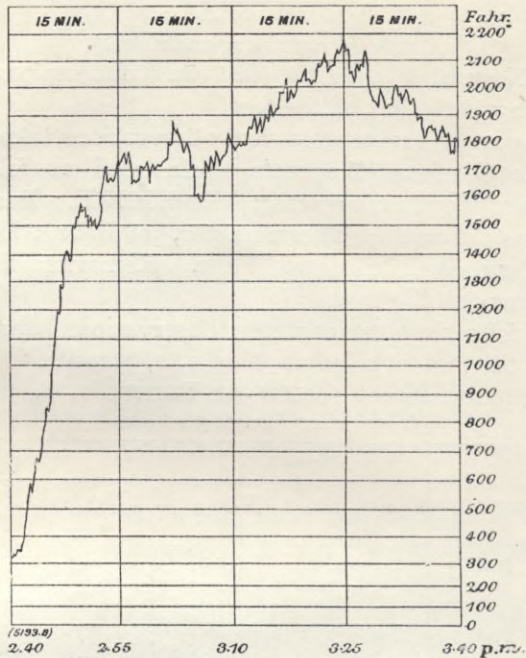
At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:— "State of weather, overcast; Wind, E.N.E.; Barometer, 30.52 ins.; Attached Thermometer, 50° Fahr.; Dry bulb, 50° Fahr.; Wet bulb, 47.8° Fahr. Remarks: fine afternoon, but dull."

The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4.

OBSERVATIONS TAKEN AT POINTS 1, 2, 3, 4.

(From 2.41 p.m. to 3.41 p.m.)

TIME.	INSIDE.		OUTSIDE.	
	NO. 1 Fahr.	NO. 4 Fahr.	NO. 2 Fahr.	NO. 3 Fahr.
2.41 p.m.	400°	400°	—	—
2.44 "	780°	775°	—	—
2.47 "	1,400°	1,350°	—	—
2.50 "	1,500°	1,450°	—	—
2.53 "	1,600°	1,550°	—	—
2.56 "	1,620°	1,510°	—	—
2.59 "	1,700°	1,650°	—	—
3.2 "	1,640°	1,530°	—	—
3.5 "	1,550°	1,630°	—	—
3.8 "	1,680°	1,740°	100°	110°
3.11 "	1,750°	1,740°	100°	145°
3.14 "	1,840°	1,810°	120°	190°
3.17 "	1,905°	1,860°	200°	240°
3.20 "	1,960°	1,880°	210°	375°
3.23 "	2,000°	750°	300°	620°
3.26 "	1,950°	1,100°	410°	830°
3.29 "	1,800°	1,000°	910°	1,100°
3.32 "	1,730°	1,700°	1,075°	1,050°
3.35 "	1,700°	950°	1,050°	1,100°
3.38 "	1,730°	1,000°	1,100°	1,135°
3.41 "	1,620°	875°	1,100°	1,200°



THE TEST *continued.*

AUSTRIAN OAK DOOR.

Observations on Outside.

At 2.40 p.m. the gas was lighted.

At 2.44 p.m. smoke over top rail.

AMERICAN WALNUT DOOR.

Observations on Outside.

At 2.40 p.m. the gas was lighted.

At 2.44 p.m. smoke over top rail at west corner by top bolt.

At 2.45 p.m. smoke over top rail spreading along top edge.

At 2.54 p.m. slight smoke issuing between joint of frame and style, west side, by lower bolt.

AUSTRIAN OAK DOOR—*continued.*

At 2.58 p.m. smoke coming through joint between lock rail and style, east side.

At 3.2 p.m. smoke coming through joint between lock rail and style, west side. Resin running down door.

At 3.7 p.m. smoke coming through joint between door and frame by lower bolt, west side.

3.11 p.m. upper panels bulging outwards at bottom.

At 3.13 p.m. flame through top of east top panel between rail and panel.

At 3.15 p.m. centre top muntin at bottom and lower edges of top panels bulging outwards to the extent of $\frac{3}{4}$ inch.

AMERICAN WALNUT DOOR—*continued.*

At 2.55 p.m. flame at intervals over top rail, west side, by top bolt.

At 2.57 p.m. slight smoke at lower corner of top panel, by style, west side.

At 2.58 p.m. flame increasing along top rail.

At 3 p.m. flame extending down style, west side.

At 3.11 p.m. upper panels, east side, bulging out at bottom, also $\frac{4}{8}$ the upper muntin at the same point.

At 3.16 p.m. flame between joint of top west panel and top rail.

AUSTRIAN OAK DOOR—*continued.*

At 3.23 p.m. the bulging of centre top muntin increasing.

At 3.25 p.m. lower west panel fell out.

At 3.31 p.m. upper panels and muntin and top rail fell out.

At 3.35 p.m. remaining portion of door fell.

Observations on Inside.

At 2.43 p.m. door began to flame on surface.

At 2.46 p.m. door blazing freely all over, and surface cracks in the charred wood very marked.

At 3.8 p.m. flakes of charred wood began to fall off the centre rail.

At 3.24 p.m. all surface of door and inside of hut so full of flame could see nothing to record.

AMERICAN WALNUT DOOR—*continued.*

At 3.22 p.m. flamethrough joint between top muntin and upper east panel.

At 3.38 p.m. door collapsed.

Observations on Inside.

At 2.44 p.m. door began to flame at top on the surface.

At 2.46 p.m. door blazing freely all over the surface.

At 3.8 p.m. door blazing freely all over, but no charred wood fallen.

At 3.24 p.m. all surface of door and inside of hut so full of flame, could see nothing to record.

WALNUT DOOR.

OAK DOOR.

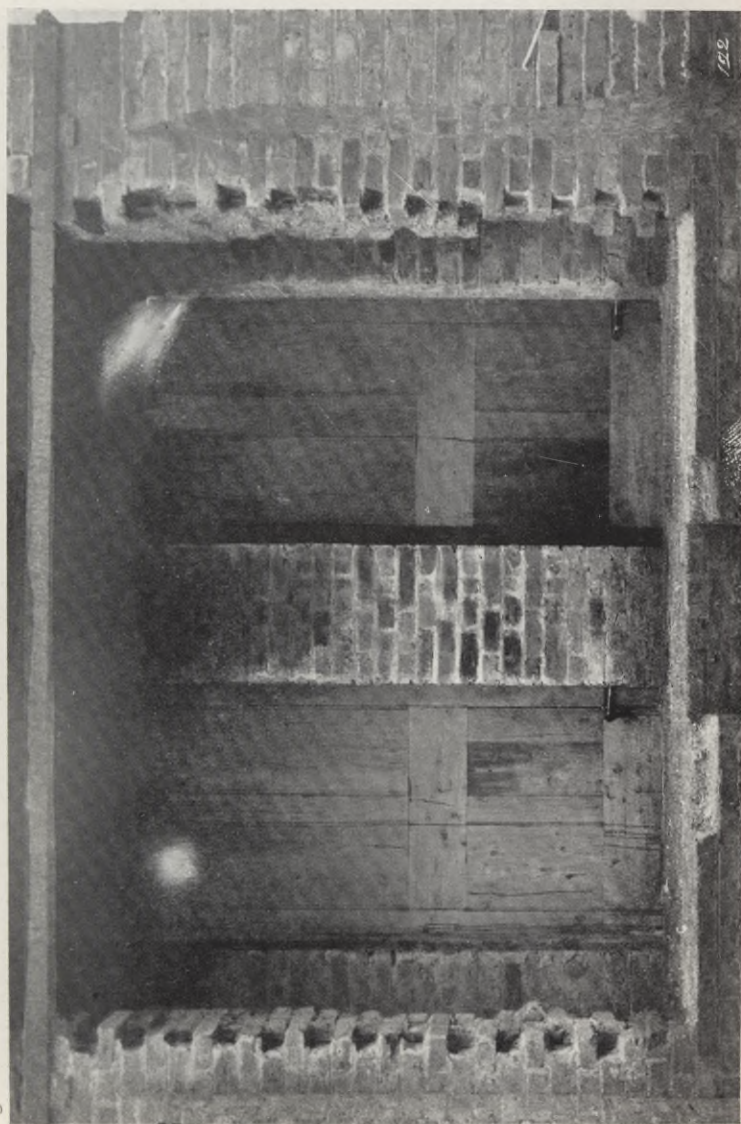


Fig. H.—VIEW SHOWING CONDITION OF DOORS AFTER 35 MINUTES.

WALNUT DOOR.

OAK DOOR.

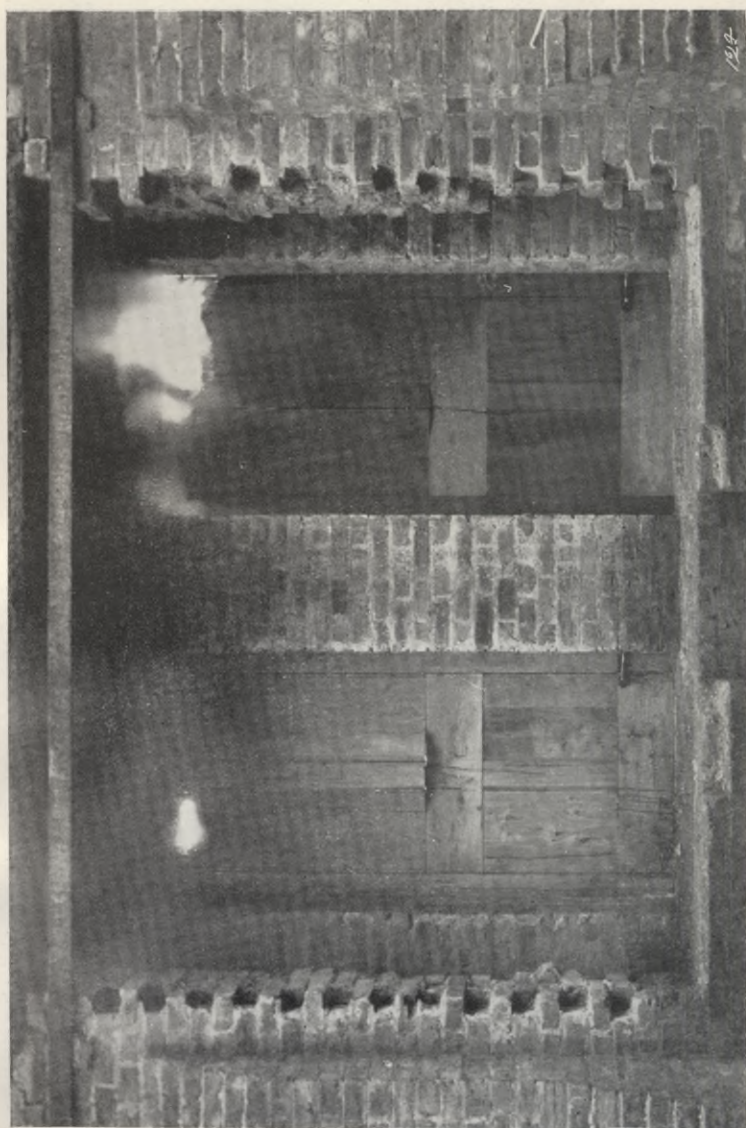
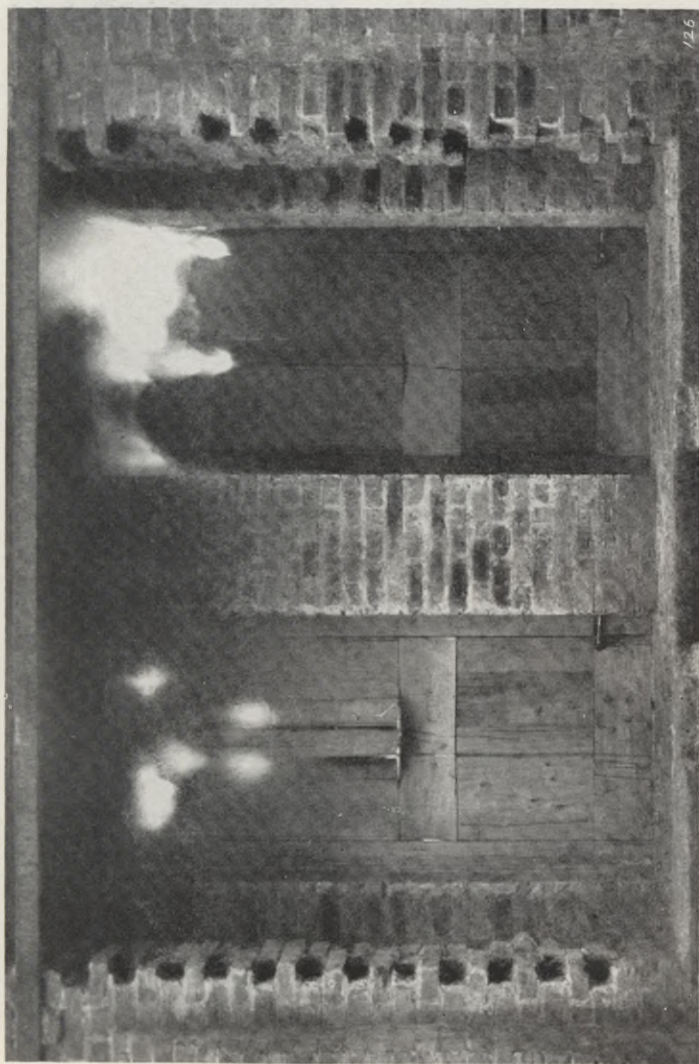


Fig. J.—VIEW SHOWING CONDITION OF DOORS AFTER 40 MINUTES.

OAK DOOR,

WALNUT DOOR,

*Fig. k.*—VIEW SHOWING CONDITION OF DOORS AFTER 43 MINUTES.

OAK DOOR.

WALNUT DOOR.

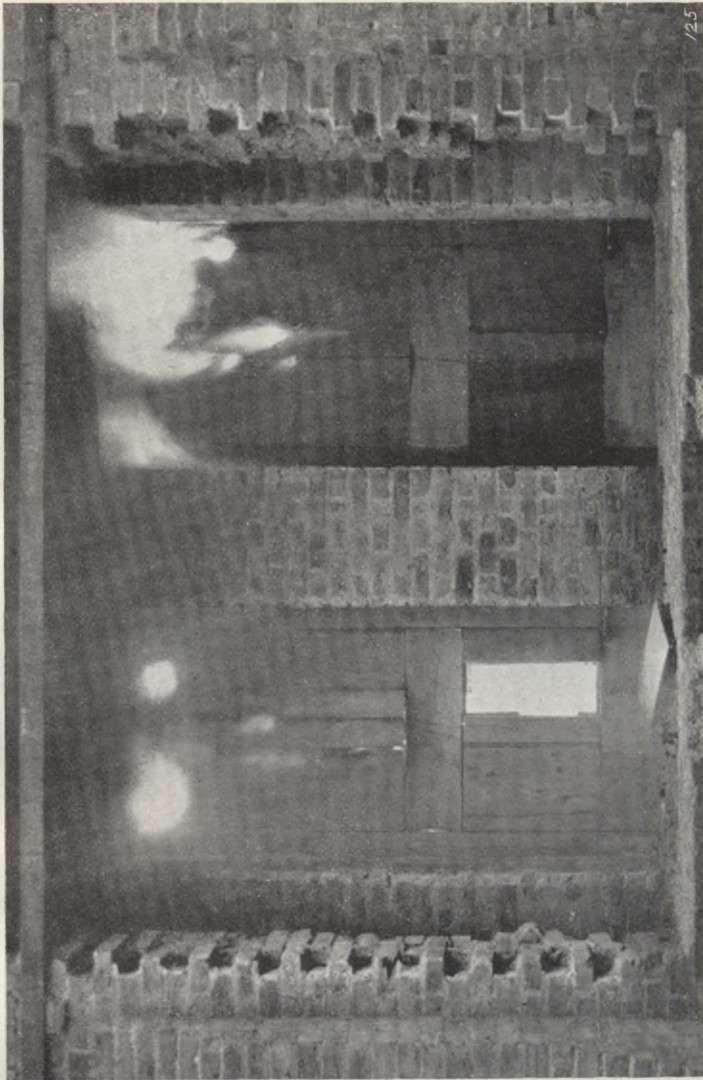


Fig. 1.—VIEW SHOWING CONDITION OF DOORS AFTER 45 MINUTES.

OAK DOOR.

WALNUT DOOR.

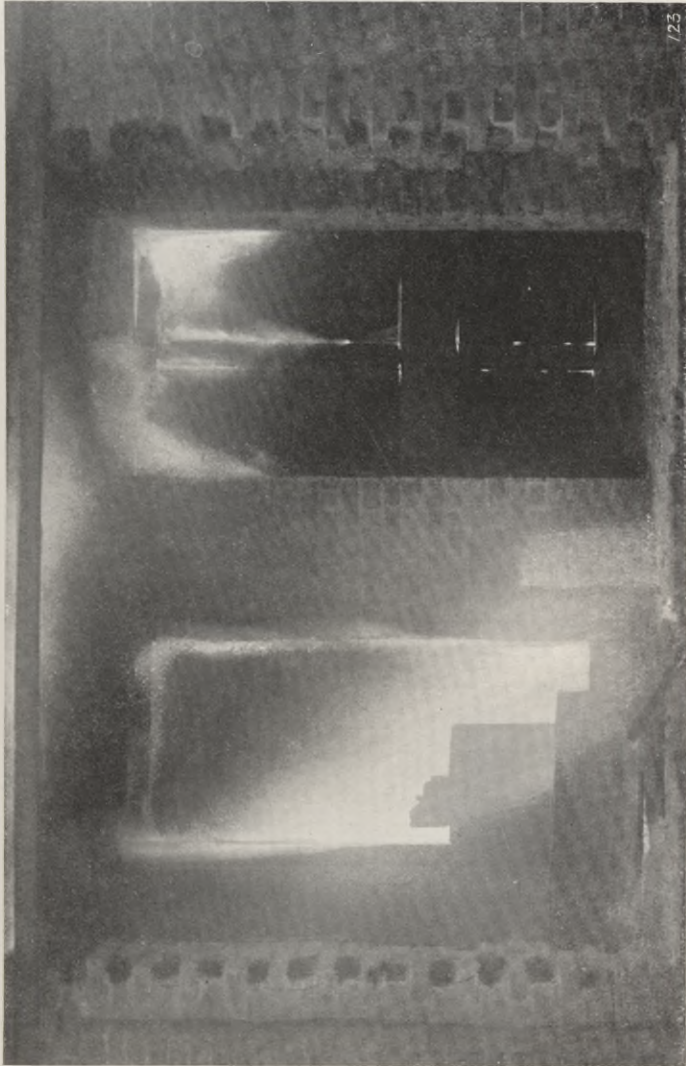


Fig. M.—VIEW SHOWING CONDITION OF DOORS AFTER 55 MINUTES.

OBSERVATIONS AFTER TEST.

AUSTRIAN OAK DOOR. AMERICAN WALNUT DOOR.

At 4 p.m., November 15th, the frame was still in position, no portion having fallen, the top west angle being burned right through, the remainder of the frame was charred, very much at the head and upper portion of posts, getting less towards foot of posts.

At 4 p.m. November 15th, the frame was still in position, no portion having fallen, the top West angle being burned through, the remainder of the frame was charred, very much at the head and upper portion of posts, getting less towards foot of posts.

GENERAL ARRANGEMENTS.

The test was carried out in accordance with the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. Max Clarke, A.R.I.B.A. (Directing Member).
 Mr. Ellis Marsland, District Surveyor, Camberwell.
 Mr. R. Mond, M.A., F.R.S.E.

Mr. Thomas Kissack (Resident Engineer at the Testing Station) assisted the Sub-Committee.

Mr. H. B. White, M.I.C.E., superintended in the Instrument Room.

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 Mr. H. Gundry, F.R.I.B.A., President District Surveyors' Association.

The Executive was represented by :—

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 Mr. F. Hammond, F.R.I.B.A., District Surveyor, East Hampstead.

The Commercial Section was represented by:—

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The Members' Testing Sub-Committee was represented by:—

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Monsieur le Capitaine Welsch, Commandant des Sapeurs-Pompiers, Ghent.

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Signed,

For the Sub-Committee conducting the Test:

MAX CLARKE.

For the Commercial Section:

FREDERIC R. FARROW.

For the Executive:

EDWIN O. SACHS.

Published by the Committee
as directed by the Execu-
tive.

H. S. TAYLOR
(Assistant Secretary).

Date—March 1st, 1900.

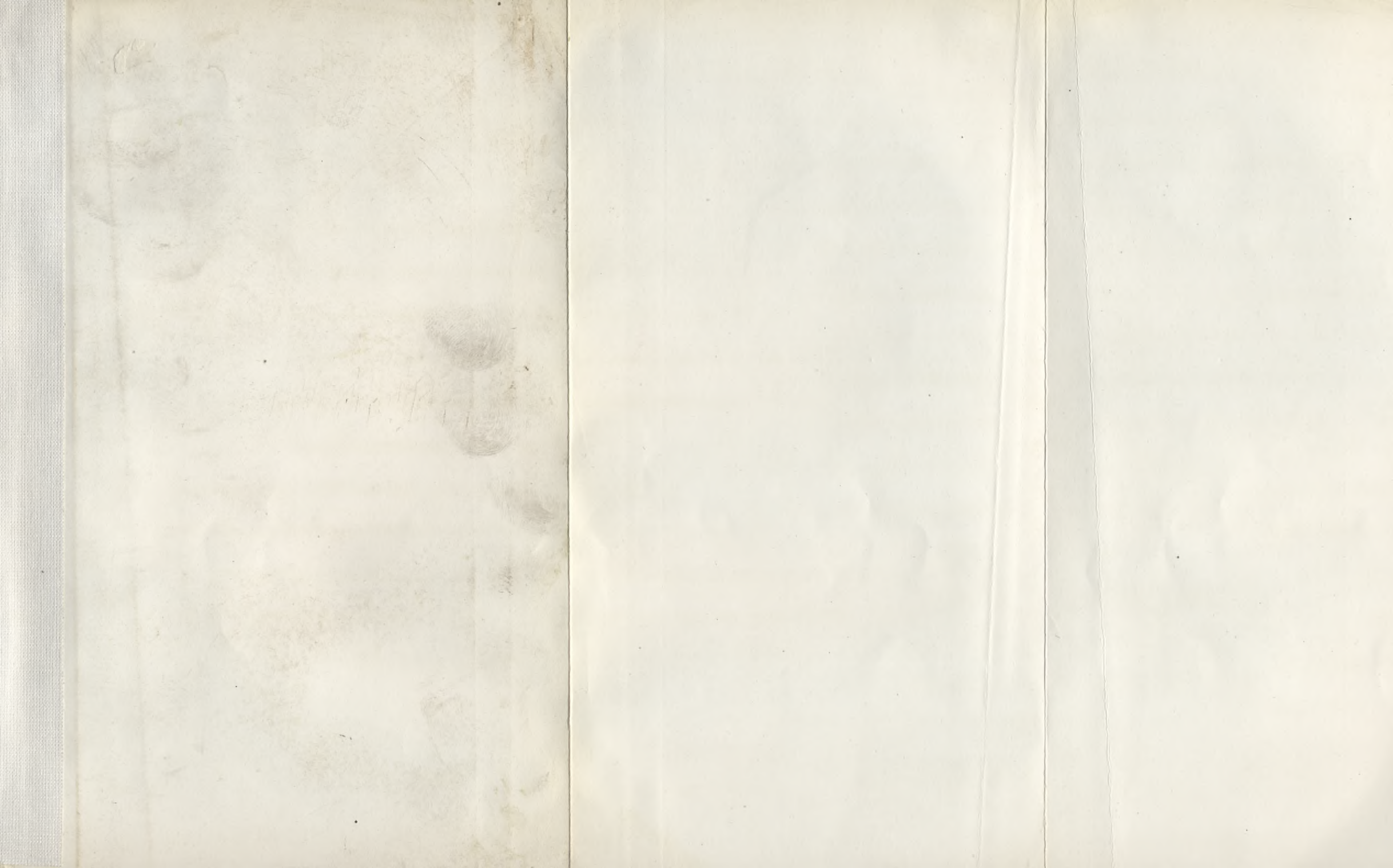




FIG 1 TIME 2.35_{pm} TEMP 965°

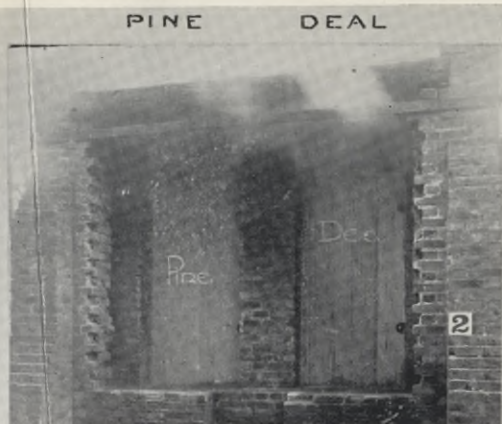


FIG 2 TIME 2.40_{pm} TEMP 1200°

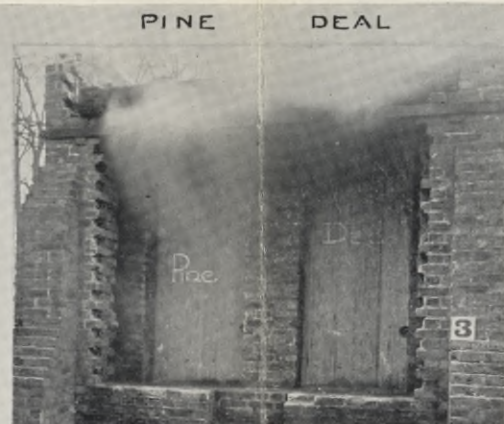


FIG 3 TIME 2.45_{pm} TEMP 1300°

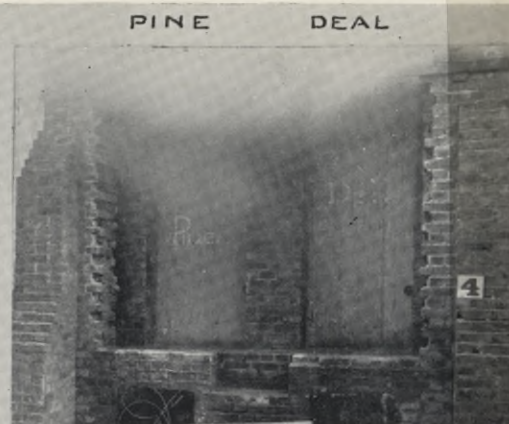


FIG 4 TIME 2.50_{pm} TEMP 1500°



FIG 5 TIME 2.55_{pm} TEMP 1650°



FIG 6 TIME 3.0_{pm} TEMP 1760°



FIG 7 TIME 3.5_{pm} TEMP 1850°



FIG 8 TIME 3.10_{pm} TEMP 1900°



FIG 9 TIME 3.15_{pm} TEMP 1850°



FIG 10 TIME 3.20_{pm} TEMP 1600°



FIG 11 TIME 3.25_{pm} TEMP 1900°



FIG 12 TIME 3.30_{pm} TEMP 2000°