

FIRE TESTS WITH DOORS.

A 2-in. FRAMED HONDURAS MAHOGANY
DOOR, WITH 2-in. SOLID PANELS.

A 2-in. FRAMED POPLAR 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 1877—Incorporated 1899).

1, WATERLOO PLACE, PAUL MALL.

Two Shillings and Sixpence.

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No. 34.—EXPERIMENTAL FIRE TESTS WITH FLOORS (R).
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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 to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

The report herewith put forward by the Executive refers to the series of experimental fire tests with doors, already dealt with in several publications. The doors here reported on are of Honduras mahogany and of poplar respectively, the size and construction of the doors being identical with the deal and pitch-pine, teak and American oak doors, which have already been under investigation.

EDWIN O. SACHS.

January 5th, 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. 6. VIEW SHOWING DOORS FROM OUTSIDE BEFORE COMMENCEMENT OF TEST.

EXPERIMENTAL FIRE TESTS
CONDUCTED BY THE EXECUTIVE
OF THE
British Fire Prevention Committee.
[FOUNDED 1897.—INCORPORATED 1899].

FIRE TESTS, V AND W, NOV. 1ST, 1899.

(V.)—A 2-in. Framed Honduras Mahogany Door with
2-in. Solid Panels.

(W.)—A 2-in. Framed Poplar 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.

MAHOGANY DOOR.

In 15 minutes a slight spurt of flame appeared between
frame and top of door and then ceased.

In 26 minutes the above flame became continuous all
along top rail of door.

In 42 minutes flame appeared through the joints of
the four outer corners of lower panels and bottom outside
corners of upper panels.

In 49 minutes door fell inwards, all bolts and hinges
being red hot, and becoming detached from the door.

POPLAR DOOR.

In 1 minute smoke came through joint between head of door and frame, the joint being $\frac{1}{4}$ in. wide.

In 5 minutes flame through the above-mentioned joint became continuous.

In 10 minutes the door was very much twisted and flame came through joint at top and part way down sides.

In 24 minutes the top west panel fell in.

In 36 minutes the whole door had collapsed and fallen inwards.

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 hut 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 chamber in which the fire was measured 10 ft. by 7 ft. 10 in.

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.

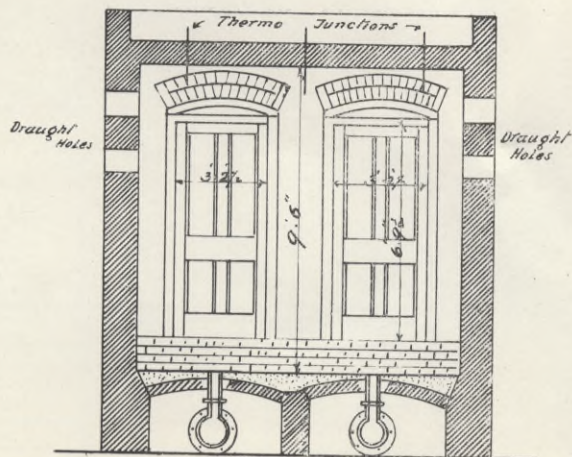
Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4; points Nos. 2 and 3 being outside the doors and the others on the fire side of doors. A continuous record was also taken from point No. 5.

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

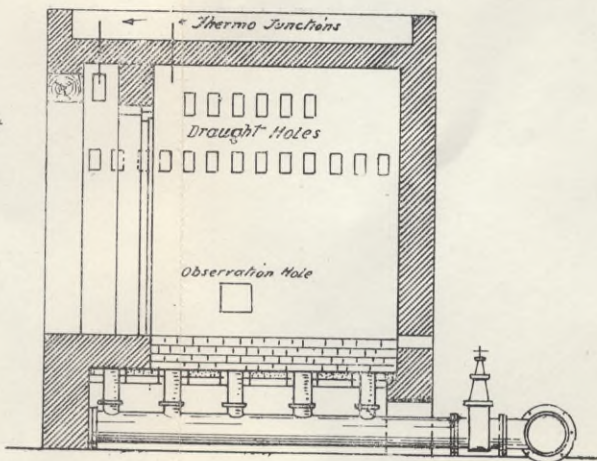
The draught holes were in the east and west walls.

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

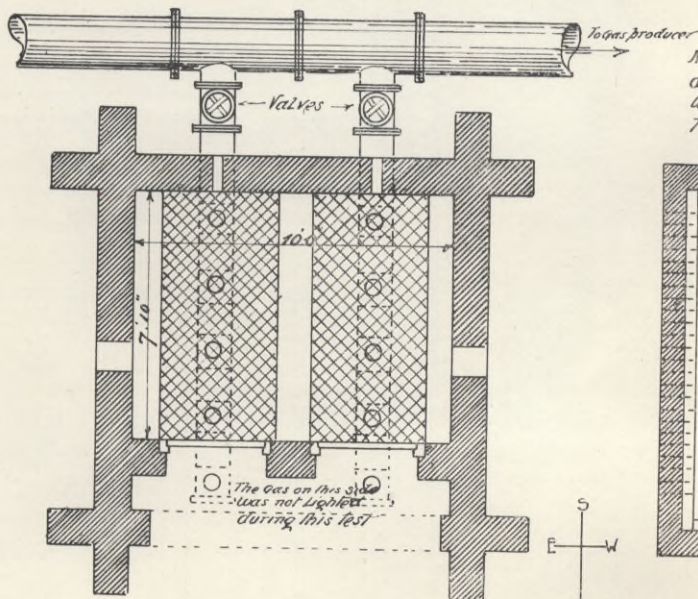
A brick wall 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from



SECTION LOOKING NORTH



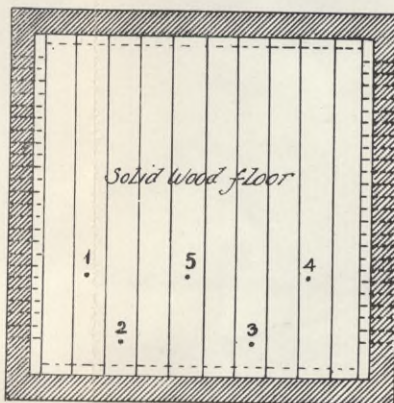
SECTION LOOKING EAST



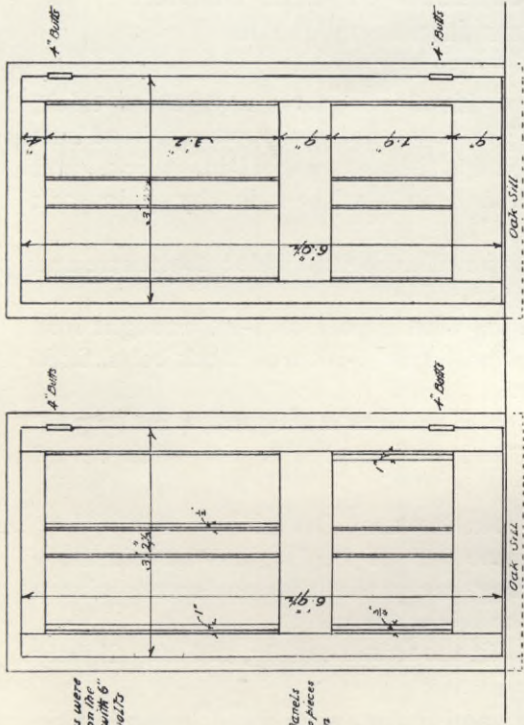
Note The joints marked 1.2.3.4.5 are Thermo Junctions attached to wires leading to Pyrometers that marked 5 is self recording

1011

PLAN OF HUT

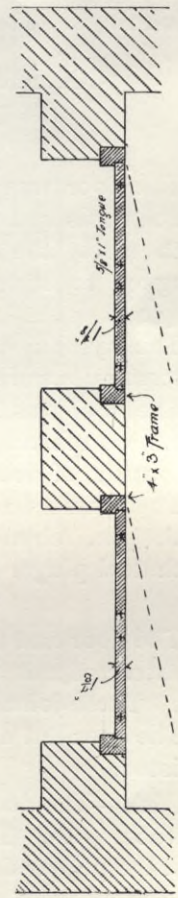


PLAN OF ROOF



The doors were bolted on the outside with 6" barrier bolts

Note The panels were in two pieces cut joints



POPLAR DOOR. MAHOGANY DOOR.
 Figs. E, F. DETAILS OF DOORS.

east to west. It was built 13 in. back from the main 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 MAHOGANY DOOR.

(See Figs. E to G).

The door was of Honduras mahogany, 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 1 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 Honduras mahogany, 4 in. by 3 in. with $\frac{1}{2}$ in. rebate, and was secured to the brick reveal with deal plugs.

THE POPLAR DOOR.

The door and frame were of Poplar, and was similarly constructed and hung, except that the panels were jointed up. These joints were not tongued.

The door did not fit the frame closely, and was slightly twisted.

Note.—The doors and frames were fixed in the hut on October 30th. The mahogany door was on the east side, and the poplar door on the west side. All joints against brickwork were stopped with fire-clay.

The doors stood 12 in. above floor of hut.

PREPARATIONS FOR TEST.

On the afternoon of November 1st 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 Wednesday, November 1st, 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, clear, fine; Rain, none; Wind, S.;
 Barometer, 29.78 in.; Attached Thermometer, 50° Fahr.;
 Dry bulb, 58.8° Fahr.; Wet bulb, 46.5° Fahr.

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

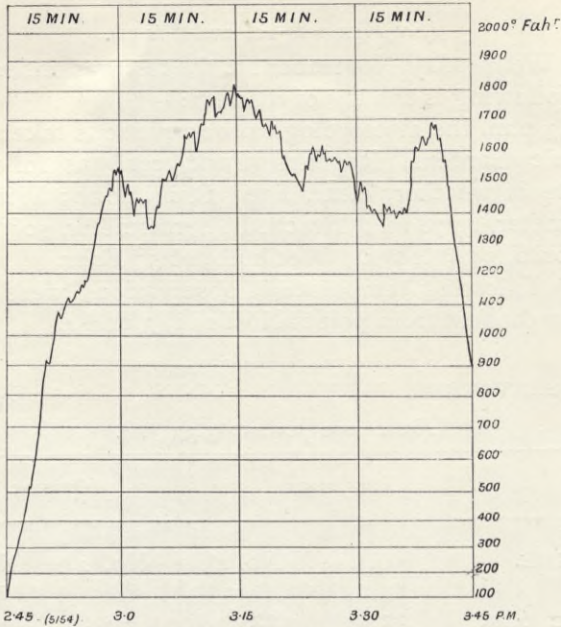
OBSERVATIONS TAKEN AT POINTS, 1, 2, 3 AND 4.

(From 2.50 p.m. to 3.33 p.m.)

TIME.	INSIDE.		OUTSIDE.	
	No. 1 Fahr.	No. 4 Fahr.	No. 2 Fahr.	No. 3 Fahr.
2.50 p.m.	225°	225°	—	—
2.53 "	810°	850°	—	—
2.56 "	1200°	1120°	—	200°
2.59 "	1275°	1200°	—	380°
3.2 "	1530°	1400°	—	745°
3.5 "	1450°	1320°	—	630°
3.8 "	1510°	1390°	—	715°
3.11 "	1605°	1475°*	100°	1090°
3.14 "	1680°	1560°	260°	920°
3.17 "	1700°	1590°	530°	1335°
3.20 "	1610°	1550°	450°	1285°
3.23 "	1530°	1510°	495°	1260°
3.26 "	1430°	1545°	300°	1315°
3.29 "	1350°	1400°	425°	1050°
3.32 "	1495°	1545°	550°	1300°
3.35 "	1600°	1625°	800°	1100°

* Wires alight.

AUTOMATIC RECORD AT POINT NO. 5.



THE TEST (continued).

MAHOGANY DOOR.

At 2.50 p.m. the gas was lighted.

Observations on Outside.

POPLAR DOOR.

At 2.50 p.m. the gas was lighted.

Observations on Outside.

At 2.51 smoke came through the joint between frame and top rail, the joint being $\frac{1}{4}$ in. wide.

At 2.53 p.m. smoke continued coming through the joint between frame and top rail, also some flame. (See Fig. 1.)

At 2.55 p.m. the above observation was continuous

MAHOGANY DOOR—*continued.*

At 3.5 p.m. very slight spurt of flame coming through joint between frame and top rail of door at west corner.

At 3.16 p.m. flame came through joint between head of door and frame and also

POPLAR DOOR—*continued.*

and also flame coming out about 12 ins. down east style.

At 3.0 p.m. flame came through joint at head of door and about 20 ins. down each side, the upper portion of door being twisted inwards, leaving a space of $\frac{3}{4}$ in. between top of door and frame, the screws fastening bolt being pulled out of the wood.

At 3.7 p.m. bottom rail of door curved inwards in the centre $\frac{1}{2}$ in. at the widest point, and flame was visible down joint between frame and west style. (See Fig. 4.)

At 3.10 p.m. top bolt and top hinge fell off, and the door was leaning 8 ins. inwards.

At 3.14 p.m. top west panel fell in. (See Fig. 5.)

MAHOGANY DOOR—*continued.*

west side of frame and style.
Door twisted inwards at top slightly.

At 3.27 p.m. joint between sill and bottom rail burnt all along, leaving an opening of about 1 in., and slight flame coming through the joints between frame and east and west styles at level of middle rail. (See Fig. 8.)

At 3.28 p.m. top bolt and plate red hot and top of door twisted inwards $\frac{1}{2}$ in.

At 3.31 p.m. half of top rail, east side, fell inwards. (See Fig. 9.)

At 3.32 p.m. flame appeared at the four outer corners of the lower panels and bottom outside corners of upper panels, also at one point between lower muntin and east panel.

At 3.35 p.m. top of door twisted inwards, leaving a space of 1 in. between door and frame (See Fig. 9.)

At 3.39 p.m. door fell inwards. (See Fig. 10.)

POPLAR DOOR—*continued.*

At 3.26 p.m. the last portion of door fell inwards. (See Fig. 8.)

Note.—At 3.33 p.m. temporary sheathed door put up to cover the opening where door was. (See Fig. 9.)

MAHOGANY DOOR—*continued.*

Observations on Inside.

At 2.56 p.m. the door burning slightly all over and slightly at the joint between door and frame.

At 3.10 p.m. door burning all over surface and flaking.

POPLAR DOOR—*continued.*

Observations on Inside.

At 2.56 p.m. the joint between door and frame was burning all round very freely and the door was slightly burning all over surface.

At 3.10 p.m. door burning all over surface and flaking.

MAHOGANY DOOR.

POPLAR DOOR.

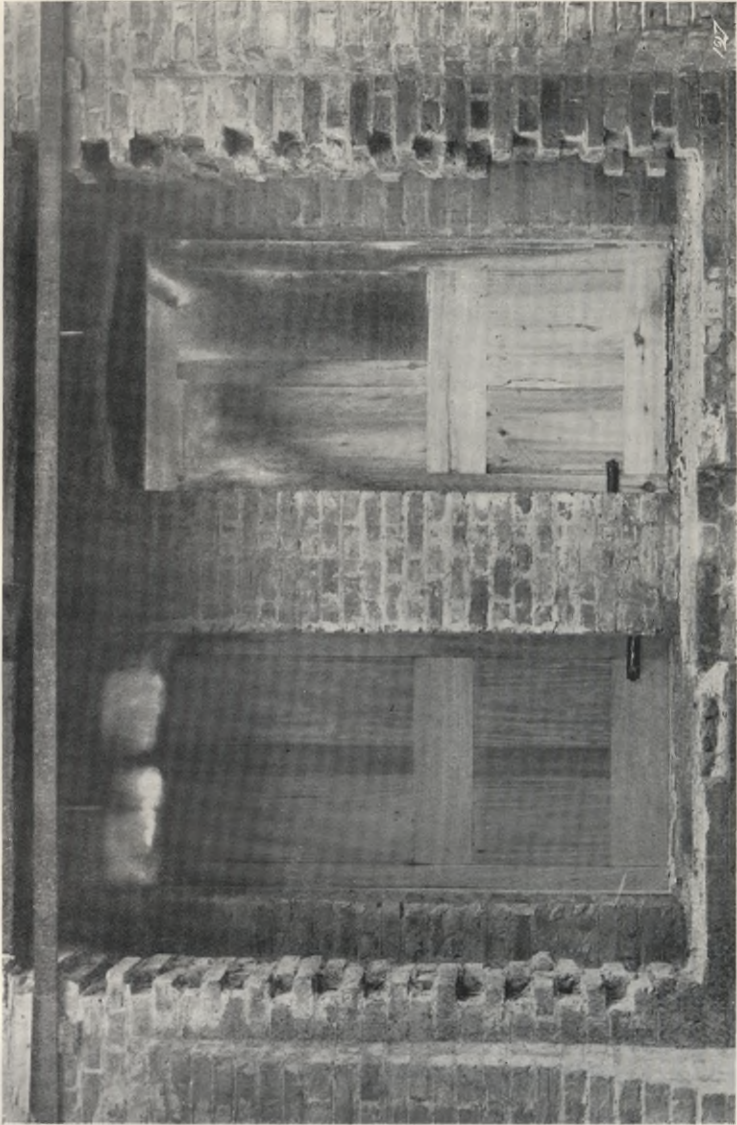


Fig. H. VIEW SHOWING CONDITION OF DOORS AFTER 25 MINUTES.

MAHOGANY DOOR,

POPLAR DOOR,



Fig. J. VIEW SHOWING CONDITION OF DOORS AFTER 35 MINUTES.

MAHOGANY DOOR.

POPLAR DOOR.

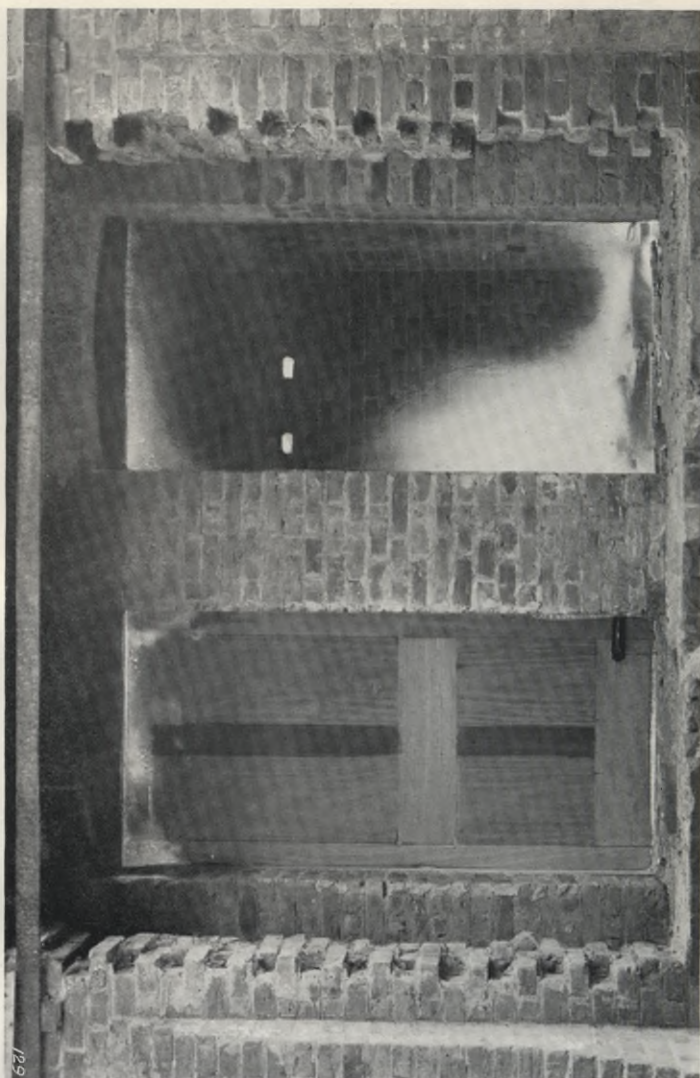


Fig. K. VIEW SHOWING CONDITION OF DOORS AFTER 40 MINUTES.

MAHOGANY DOOR.

TEMPORARY DOOR.



Fig. 1. VIEW SHOWING CONDITION OF MAHOGANY DOOR AFTER 45 MINUTES.

TEMPORARY DOOR.

MAHOGANY DOOR.

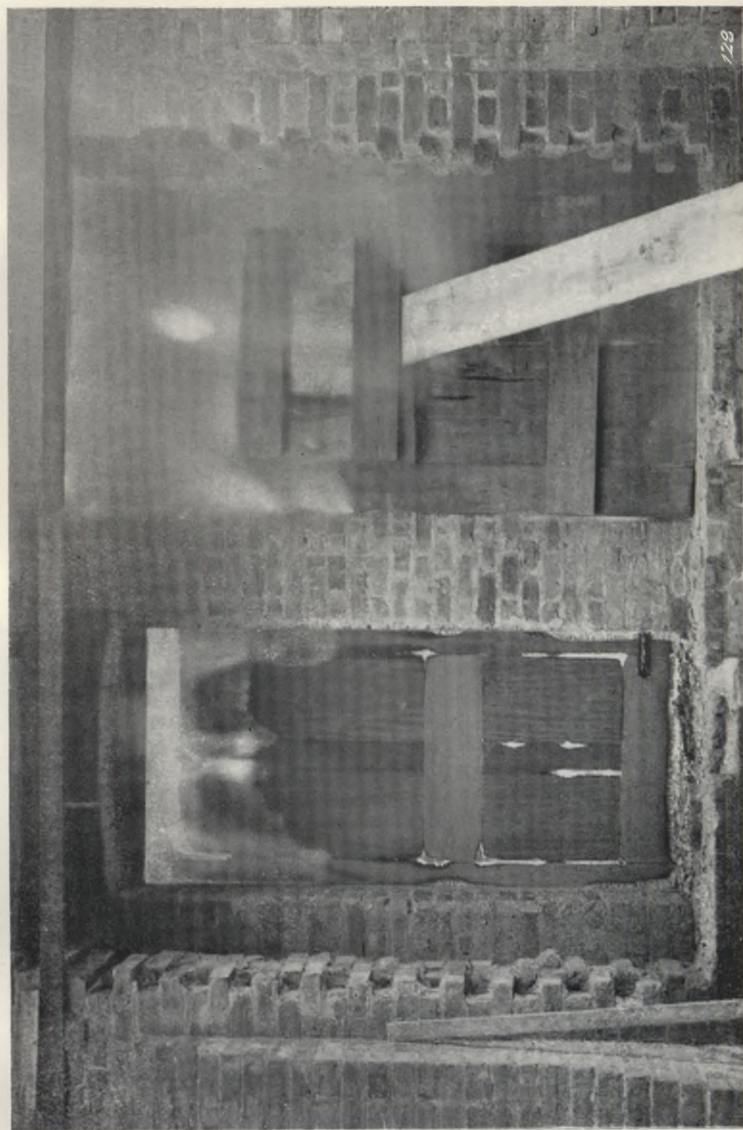


Fig. M. VIEW SHOWING CONDITION OF MAHOGANY DOOR AFTER 48 MINUTES.

OBSERVATIONS AFTER TEST.

MAHOGANY DOOR.

After the test the frame was seen to have been burnt very considerably, but no portion of it was burnt completely through or fallen.

POPLAR DOOR.

After the test the temporary door was taken down, and all the frame was seen to have been burnt, and all had fallen except a small portion of the head.

GENERAL ARRANGEMENTS.

The test was carried out as an experimental test 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. George Monckton, M.A.

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

Mr. H. B. White, M.I.E.E., superintended the instrument room.

The Executive was represented by:—

- Mr. Edwin O. Sachs (Chairman).
- Mr. F. Hammond, District Surveyor, Hampstead.
- Mr. Robert Mond.

The Commercial Section was represented by:—

- Mr. Fred. R. Farrow, F.R.I.B.A.

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.

GEORGE E. MONCKTON

(Secretary).

Date—January 1st, 1900.

OAK WALNUT



FIG 1 TEMP 1075° TIME 2.45pm

OAK WALNUT

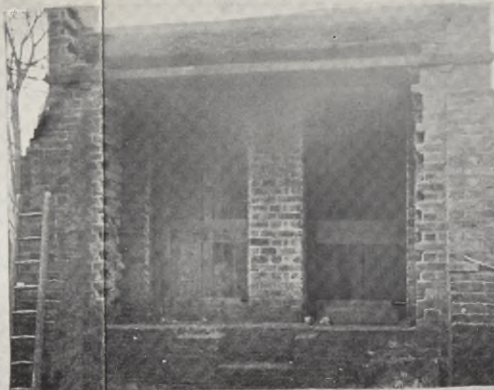


FIG 2 TEMP 1475° TIME 2.50pm

OAK WALNUT

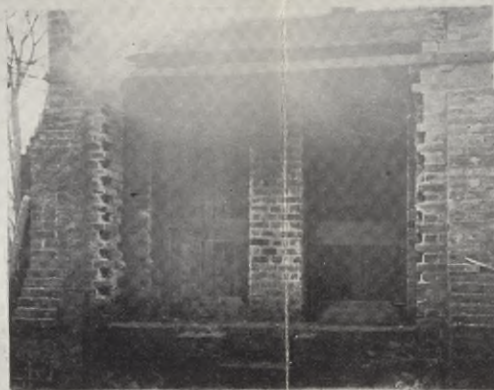


FIG 3 TEMP 1560° TIME 2.55pm

OAK WALNUT



FIG 4 TEMP 1630° TIME 3.0pm



FIG 5 TEMP 1590° TIME 3.5pm

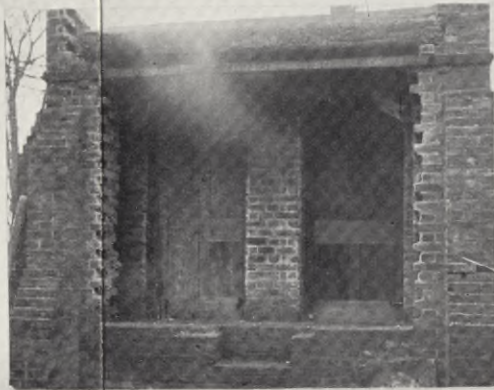


FIG 6 TEMP 1720° TIME 3.10pm



FIG 7 TEMP 1850° TIME 3.15pm



FIG 8 TEMP 1900° TIME 3.20pm



FIG 9 TEMP 1450° TIME 3.25pm



FIG 10 TEMP 1400° TIME 3.30pm



FIG 11 TEMP 1370° TIME 3.35pm

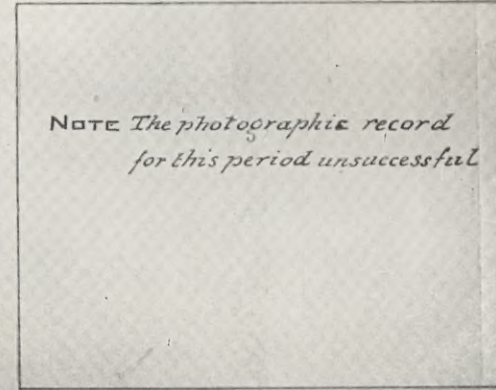


FIG 12 TEMP 1300° TIME 3.40pm

NOTE The photographic record
for this period unsuccessful

