

Publications of the

BRITISH FIRE PREVENTION COMMITTEE.—No. 35.

Edited by Edwin O. Sachs.

FIRE TESTS WITH DOORS.

A 2-in. FRAMED PITCH PINE DOOR, WITH
2-in. SOLID PANELS.

A 2-in. FRAMED DEAL DOOR, WITH 2-in.
SOLID PANELS.

Particulars

OF

EXPERIMENTAL FIRE TESTS.

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LONDON, 1899.

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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 intended to read as expressions of opinion, criticisms, or comparisons.

NOTE.

The report here under consideration again deals with doors, and should be read in connection with other reports on this series of investigations, the reports in question issued to date being those embodied in Publications Nos. 24, 25, and 26, whilst a number of others are already in the press, or in course of preparation.

The doors which have been here reported on were constructed of pitch pine and of deal respectively, and as far as size and the form of construction is concerned, they scarcely differ from the oak door and the teak door reported upon in publication No. 26.

Four more doors of practically identical construction and dimensions are being dealt with, *i.e.*, one of mahogany, one of poplar, one of walnut, and one of Austrian oak. The Executive is further considering the effect of fire on forms of wood door construction different to that here shown, and will then proceed to undertake further tests, firstly with armoured wood doors, and secondly with iron doors of various pattern and make.

The report on the doors here under consideration speaks for itself, and the only points I think I should refer to are, firstly that the doors are again hung to open inwards into the fire, and secondly that the Committee is again indebted for the excellent photographs to the arrangements made by Mr. Ellis Marsland.

EDWIN O. SACHS.

LONDON,

December 9th, 1899.

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.

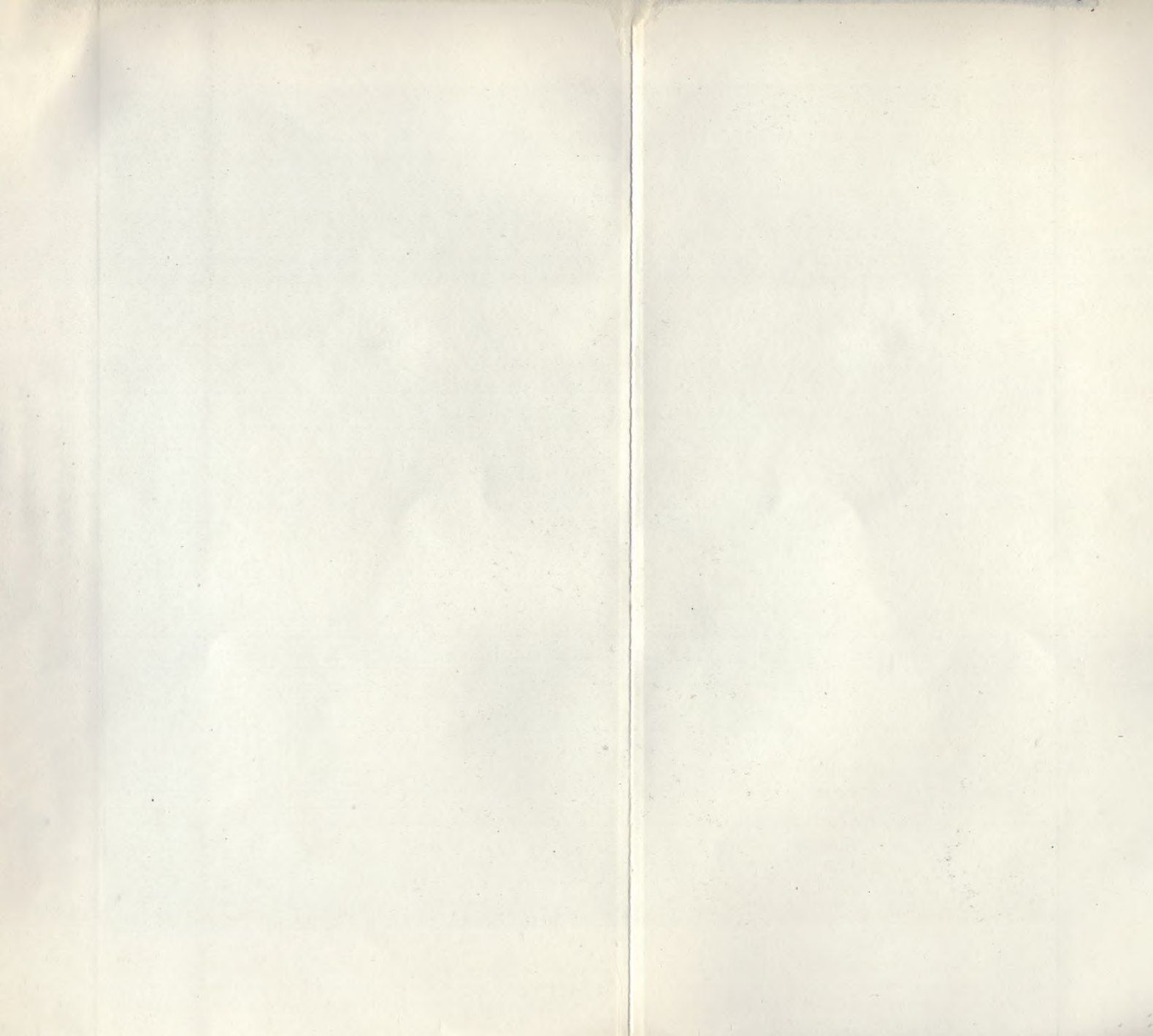
As to the Testing Station, it comprises two houses standing in their own grounds near Regent's Park, and backing on to the Regent's Canal. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

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.*



PITCH PINE DOOR.

DEAL DOOR.



THE DOORS. *Fig. 6.* VIEW SHOWING DOORS BEFORE TEST (FROM OUTSIDE).

EXPERIMENTAL FIRE TESTS
CONDUCTED BY THE EXECUTIVE
OF THE
British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

FIRE TESTS S AND T, OCTOBER 18TH, 1899.

S.—A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels.

T.—A 2-in. Framed Deal 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.

PITCH PINE DOOR.

In 20 minutes flame appeared over top rail of door.

In 36 minutes flame had extended down top rail to upper panels of door, and panels had bulged.

In 50 minutes the upper panels and muntin fell out.

In 57 minutes the remainder of the door collapsed and fell outwards.

DEAL DOOR.

In 17 minutes flame appeared over top rail of door.

In 30 minutes flame had extended down top rail to upper panels of door.

In 50 minutes flame extended down door to below centre of upper panels, and fire was seen through lower panel.

In 57 minutes the door fell in bodily.

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 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.

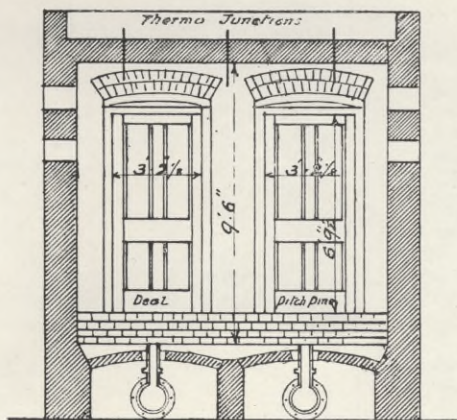
Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4, and one automatic record from point No. 5. Points Nos. 2 and 3 were outside the doors, and the others on the fire side of doors. (*See roof plan*).

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

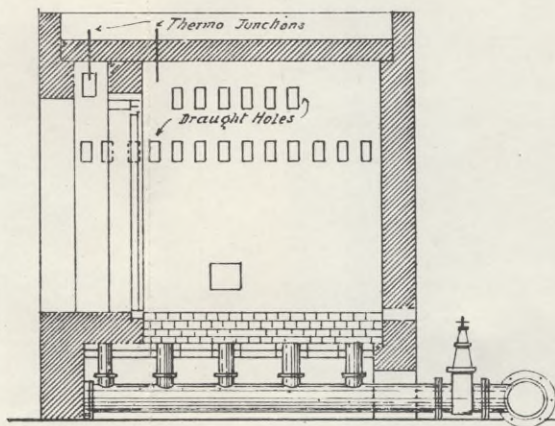
The draught holes were in the east and west walls.

The photographs were taken by daylight.

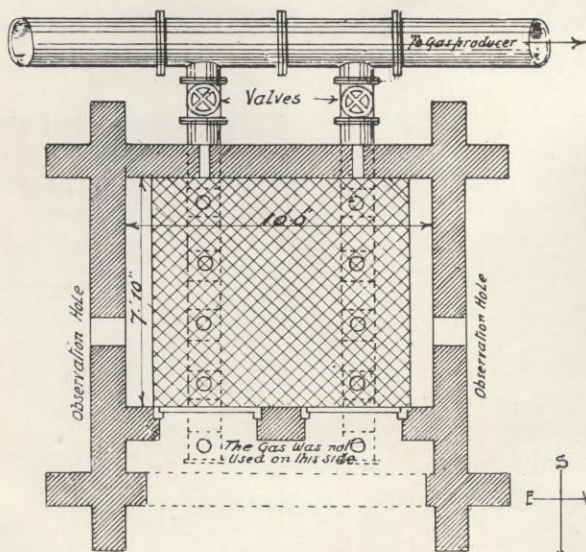
A brick wall 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from east to west. It was built 13 in. back from the main wall. The wall was carried up to the ceiling, the height between floor and ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.



SECTION LOOKING NORTH



SECTION LOOKING EAST



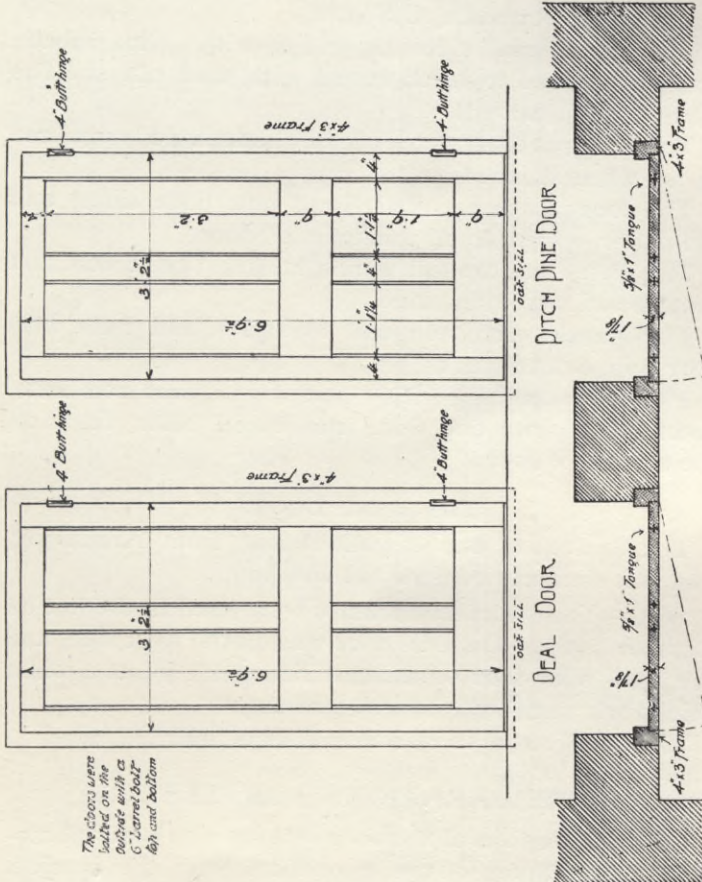
PLAN OF HUT

Note. The 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

THE TESTING CHAMBER. Figs. A, B, C, D. PLANS AND SECTIONS.



The doors were
 built on the
 outside with a
 6" larvel body
 top and bottom

DETAILS OF DOORS. Figs. E, F. INSIDE.

CONSTRUCTION OF THE DOORS.

THE PITCH PINE DOOR.

(See Figs. E to G).

The door and frame were constructed of pitch pine, from Mobile, Alabama, U.S.A.

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

The door was constructed of 2 in. planks, which measured $1\frac{7}{8}$ in. when finished.

The door was in 4 panels, bead butt both sides, and the panels were the full thickness of door.

The styles and top rail were 4 in. wide; the centre and bottom rail were 9 in. wide.

The panels were tongued to styles and rails with 1 by $\frac{5}{8}$ in. oak tongues.

The door was hung with 1 pair of 4-in. wrought iron butts, and fastened with two 6-in. iron barrel bolts, fixed on the outside of door.

THE DEAL DOOR.

The deal door was of yellow deal, from Archangel, and was similarly constructed and hung.

Note.—The doors and frames were fixed in the hut on October 17th. The deal door was on the west side, and the pitch pine door on the east 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 October 18th, at 2.30 p.m., photographs were taken of the two doors from the outside. (See Fig. G).

THE TEST.

(See Figs. I to 12, and H to L).

On October 18th 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, fine and bright; Wind, E.S.E.;
 Barometer, 30·34; Attached Thermometer, 53° Fahr.;
 Dry bulb, 50° Fahr.; Wet bulb, 48·5° 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, 4.

From 3.15 p.m. to 4.12 p.m.

TIME.	INSIDE.		OUTSIDE.	
	No. 1. Fahr.	No. 4. Fahr.	No. 2. Fahr.	No. 3. Fahr.
3.15 p.m.	—	—	—	—
3.20 "	290°	310°	—	—
3.25 "	650°	1,075°	—	—
3.27 "	1,275°	1,290°	—	—
3.30 "	1,290°	1,350°	50°	60°
3.33 "	1,475°	1,440°	75°	150°
3.36 "	1,495°	1,495°	100°	275°
3.39 "	1,520°	1,450°	190°	395°
3.42 "	1,490°	1,500°	245°	450°
3.45 "	1,550°	1,560°	400°	575°
3.48 "	1,560°	1,530°	830°	670°
3.51 "	1,500°	1,450°	1,075°	750°
3.54 "	1,490°	1,500°	1,200°	810°
3.57 "	1,600°	1,625°	1,280°	1,120°
4.0 "	1,620°	1,620°	1,120°	1,295°
4.3 "	1,650°	1,680°	500°	1,375°
4.6 "	1,525°	1,600°	—	1,440°
4.9 "	1,500°	1,550°	—	1,450°
4.12 "	1,400°	1,440°	380°	1,450°

Note.—No record was obtained from point No. 5.

PITCH PINE DOOR.

At 3.15 p.m. the gas was turned on.

Observations on Inside.

At 3.21 p.m. door caught fire.

At 3.25 p.m. door was flaming.

At 3.42 p.m. and after, door flaming freely all over.

Observations on Outside.

At 3.23 p.m. smoke issuing between rebate of frame and top rail of door.

At 3.24 p.m. dense smoke issuing between rebate of frame and meeting style and top rail of door. See Fig 2.

DEAL DOOR.

At 3.15 p.m. the gas was turned on.

Observations on Inside.

At 3.21½ p.m. door caught fire.

At 3.25 p.m. door was flaming.

At 3.31 p.m. door was much charred all over surface.

At 3.32 p.m. the flames were stronger.

At 3.42 p.m. and after door flaming freely all over.

Observations on Outside.

At 3.21 p.m. smoke appeared between rebate of frame and styles of door on each side towards top.

At 3.24 p.m. dense smoke issuing between rebate of frame and top rail of door. See Fig. 2.

PITCH PINE DOOR—*continued.*

At 3.35 p.m. flame appeared between rebate of frame and top rail of door by bolt. See Fig. 5.

At 3.40 p.m. flame extending along top rail. See Fig. 6.

At 3.41 p.m. the door was cool to the hand generally, but warm about 1 ft. above lock rail.

At 3.42 p.m. flame appeared through west top panel at upper edge.

At 3.46 p.m. resin in wood running down door in streaks. See Fig. 7.

At 3.48 p.m. lower edge of top panels bulging outwards and flame spreading down top panels. See Figs. 7 and 8.

At 3.50 p.m. the two top panels and west bottom panel were bulging outwards.

DEAL DOOR—*continued.*

At 3.32 p.m. flame burst between rebate of frame and top rail of door. See Fig. 4.

At 3.35 p.m. flame spreading down top rail and also down hanging style. See Fig. 5.

At 3.41 p.m. the door was cool to the hand generally, but warm about 1 ft. above lock rail.

At 3.42 p.m. flame appeared through joint between top rail and the two upper panels.

At 3.46 p.m. flame extending down top rail to top panels of door. See Fig. 7.

At 3.50 p.m. the bottom west panel was bulging outwards, flame appeared in two places at the rebate next the butts, also in centre of bottom rail.

PITCH PINE DOOR—*continued.*

At 3.51 p.m. fire extending down the top panels. See Fig. 8.

At 3.53 p.m. fire still extending down the top panels. See Fig. 9.

At 3.55 p.m. flame appeared on east side between rebate of door frame and door and along bottom edge of bottom rail near to hanging style and through top east panel at bottom corner.

At 3.57 p.m. flame appeared through joints between top muntin and panels and styles. See Fig. 10.

At 3.58 p.m. the lock rail was bulging outwards, the muntin between top panels well alight.

At 4 p.m. flame appeared through bottom west panel. The upper part of the door was well alight.

DEAL DOOR—*continued.*

At 3.51 p.m. flame appeared through rebate between frame and hanging style from 4 to 14 inches from the bottom.

At 3.53 flame appeared through the joint between bottom right-hand panel and centre style. This panel bulging increasingly outwards.

At 3.55 p.m. flame appeared through rebate next lower bolt to depth of bottom rail and through joint between the lock rail and hanging style.

At 3.58 p.m. the bottom right-hand panels were bulging out.

At 3.59 p.m. flame appeared through joint between the lower muntin and right bottom panel. See Fig. 10.

PITCH PINE DOOR—*continued.*

At 4.4 p.m. the top rail fell out.

At 4.5 p.m. flame appeared through joints between bottom panels and styles. The top panels and muntin fell out.

At 4.10 p.m. the bottom panels fell out. See Fig. 12.

At 4.12 p.m. the bottom muntin fell out. The door collapsed outwards.

At 4.13 p.m. the gas was shut off.

At 4.14 p.m. water was applied and the test was closed.

DEAL DOOR—*continued.*

At 4.5 p.m. flame appeared through bottom west panel. See Fig. 11.

At 4.10 p.m. the top rail fell out. Door flaming nearly all over. See Fig. 12.

At 4.11 p.m. The west bottom panel fell out.

At 4.12 p.m. the door fell in bodily.

At 4.13 p.m. the gas was shut off.

At 4.14 p.m. water was applied and the test was closed.



Fig. H. VIEW SHOWING CONDITION OF DOORS AFTER 25 MINUTES.
PITCH PINE.
DEAL.



Fig. 1. VIEW SHOWING CONDITION OF DOORS AFTER 40 MINUTES.
PITCH PINE. DEAL.

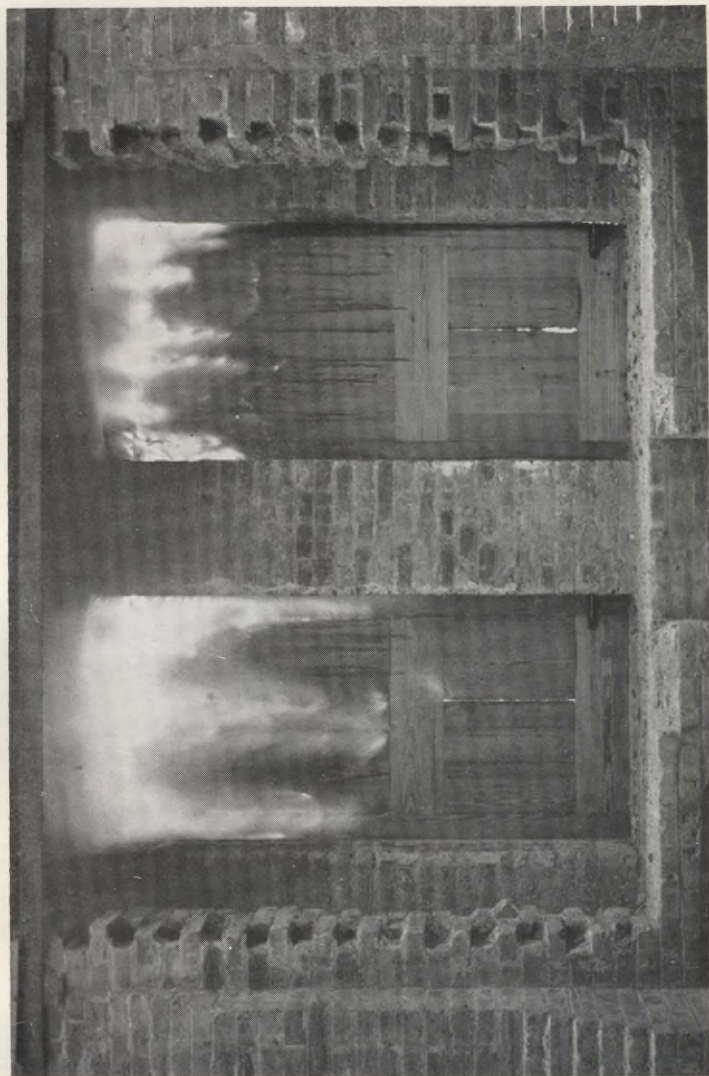
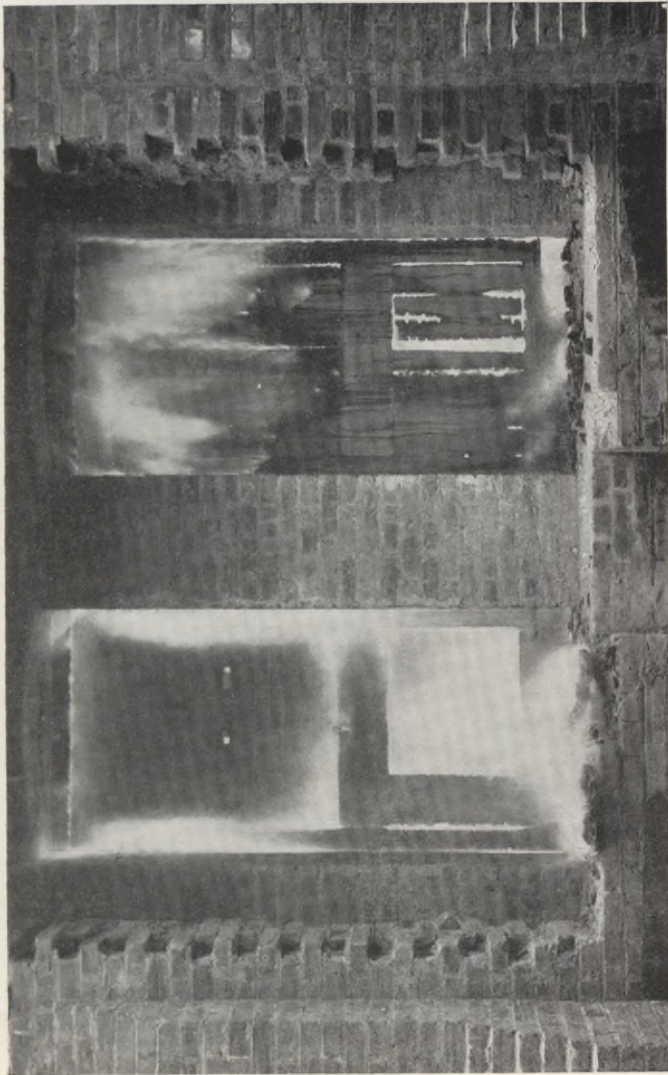


Fig. K. VIEW SHOWING CONDITION OF DOORS AFTER 45 MINUTES.
PITCH PINE. DEAL.



*Fig. L. VIEW SHOWING CONDITION OF DOORS AFTER 55 MINUTES.
PITCH PINE. DEAL.*

OBSERVATIONS AFTER TEST.

PITCH PINE DOOR.

On October 18th, later.
The door frame was still in position, but charred on the inside face.

DEAL DOOR.

On October 18th, later.
The door frame was still in position, but charred on the inside face.

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. F. Hammond, F.R.I.B.A., District Surveyor,
East Hampstead (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. T. E. Leslie Alldridge (Royal Mint), and Mr. H. B. White, M.Inst.E.E., superintended the instrument room.

The Executive was represented by:—

Mr. Edwin O. Sachs (Chairman).

Mr. Max Clarke, A.R.I.B.A.

Mr. Charles E. Goad, M.Am.Soc.C.E.

The Council was represented by:—

Mr. H. H. Collins, F.R.I.B.A., F.S.I., District Surveyor, Eastern Division, City of London.

A number of visitors representing the Press attended by special invitation of the Executive.

Signed,

For the Sub-Committee conducting the Test :

F. HAMMOND.

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—November 29th, 1899.

