

*Publications of the*

*BRITISH FIRE PREVENTION COMMITTEE.—No. 59.*

*Edited by Edwin O. Sachs.*

# FIRE TESTS WITH DOORS.

A DEAL LEDGED DOOR WITH ONE-INCH  
BOARDING.

A TWO-INCH DEAL FOUR-PANEL MOULDED  
BOTH SIDES DOOR.

## Particulars

OF

EXPERIMENTAL FIRE TESTS.

*ALL RIGHTS RESERVED.*

LONDON, 1900.

PUBLISHED AT THE OFFICES OF  
THE BRITISH FIRE PREVENTION COMMITTEE  
(Founded 1837—Incorporated 1899),  
1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence nett.*

# PUBLICATIONS

OF THE

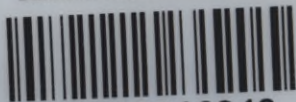
## BRITISH FIRE PREVENTION COMMITTEE. 11-354319



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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.

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*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 series of door tests undertaken by the Committee would not be complete if some record were not obtained regarding the resistance afforded by the more ordinary forms of doors in every-day use.

In an earlier publication (No. 24) some such records were already presented, but the doors under investigation were smaller than those that have lately been before the Committee, and the circumstances under which these tests were undertaken were very different.

So as to make the series of reports as complete as possible, and so as to afford every facility for true comparison, some further tests with a four-panel door and a ledged door, both of yellow deal, were arranged for during the past summer.

I trust that the results embodied in this publication will be found useful.

EDWIN O. SACHS.

LONDON,

*December 15th, 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. 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.*

# EXPERIMENTAL FIRE TESTS

CONDUCTED BY THE EXECUTIVE

OF THE

## British Fire Prevention Committee.

[FOUNDED 1897.—INCORPORATED 1899.]

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FIRE TESTS IA AND JA, JULY 11TH, 1900.

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Ia.—A Deal Ledged Door with 1-in. Boarding.

Ja.—A 2-in. Deal Four-panel moulded both sides Door.

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### 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.

#### DEAL LEDGED DOOR.

In 4 minutes flame appeared over top of door.

In 8 minutes flame had extended all along top.

In 21 minutes the upper half of door was fully alight.

In 25 minutes the test was closed, as the door was practically destroyed.

## DEAL FOUR-PANEL MOULDED BOTH SIDES DOOR.

In 15 minutes flame appeared over top rail of door.

In 16 minutes flame came through top panel.

In 21 minutes flame came through lower panels.

In 25 minutes the test was closed, as the door was practically destroyed.

## 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. 6 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.

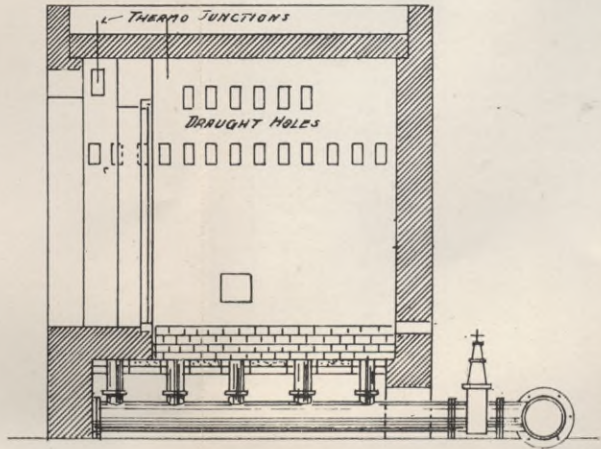
The photographs were taken by daylight.

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

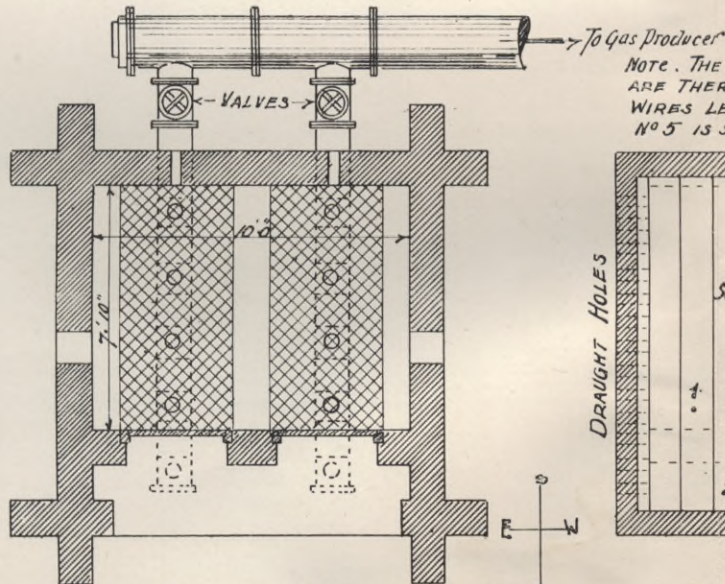




SECTION LOOKING NORTH



SECTION LOOKING EAST

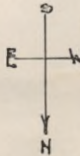


NOTE. THE POINTS MARKED 1.2.3.4.5 ARE THERMO JUNCTIONS ATTACHED TO WIRES LEADING TO PYROMETERS, NO 5 IS SELF RECORDING



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PLAN OF HUT



PLAN OF ROOF

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



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.

### DEAL LEDGED DOOR.

(See Figs. E to G).

The door was constructed, as shown in Figs. E and F, of wrought yellow deal. The vertical boards were tongued, grooved and beaded, and were 6 in. wide and 1 in. thick.

The ledges were 6 in. by 1 in., chamfered on edges.

The ledges and boards were screwed together with  $1\frac{1}{2}$  in. screws.

The frame was of yellow deal  $4\frac{1}{2}$  in. by  $3\frac{1}{2}$  in. with a rebate for door  $\frac{5}{8}$  in. deep.

The sill was of oak,  $4\frac{1}{2}$  in. by  $3\frac{1}{2}$  in.

The door was hung with one pair of 20-in. cross garnetts, and fastened with a rim lock.

Neither the door or frame were painted.

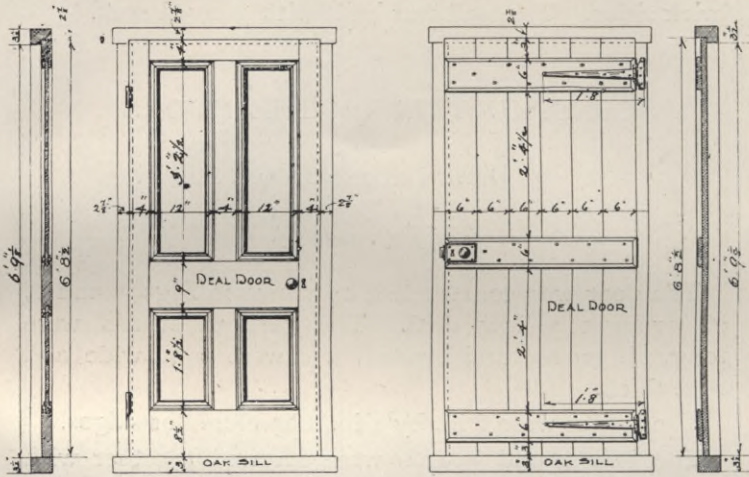
### THE DEAL FOUR-PANEL DOOR.

The door was constructed, as shown in Figs. E and F, of wrought yellow deal. The styles, rails and head were  $1\frac{7}{8}$  in. thick, and the panels were  $\frac{5}{8}$ -in. thick. The moulding around panels was  $1\frac{3}{4}$  in. wide, and was fixed in panels on both sides of door.

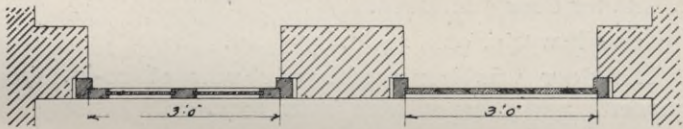
The frame was of yellow deal  $4\frac{1}{2}$  in., by  $3\frac{1}{2}$  in. with a rebate for door  $\frac{5}{8}$  in. deep.

The sill was of oak  $4\frac{1}{2}$  in. by 3 in.

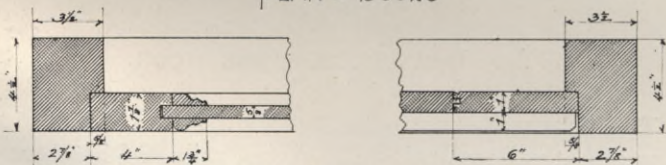
The door was hung with one pair of 4 in. wrought iron butts, and fastened with a mortice lock and brass furniture.



INSIDE ELEVATIONS AND SECTIONS OF DOORS



PLAN OF DOORS



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ENLARGED DETAIL OF DOORS

Figs. E, F.

PREPARATIONS FOR TEST.

On the afternoon of July 11th, photographs were taken of the two doors from the outside. (See Fig. G).

## THE TEST.

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

On July 11th, the test was undertaken. The following is the log of the test :—



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

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :—  
 "State of weather, Clear and fine; Wind, N.W.;  
 Barometer, 30·07; Attached Thermometer, 72·4° Fahr.;  
 Dry bulb, 83° Fahr.; Wet bulb, 65·5° Fahr."

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

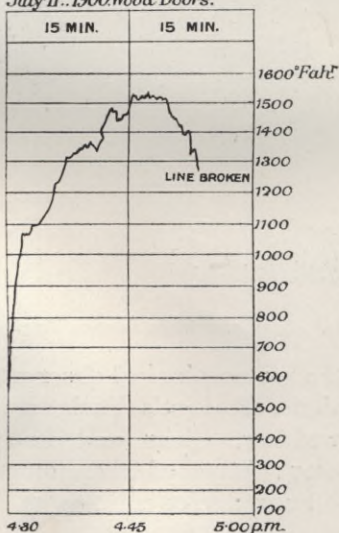
## OBSERVATIONS TAKEN AT POINTS, 1, 2, 3, 4.

*From 4.33 p.m. to 4.54 p.m.*

TIME.	INSIDE.		OUTSIDE.	
	No. 1. Fahr.	No. 4. Fahr.	No. 2. Fahr.	No. 3. Fahr.
4.30 p.m.	—	—	—	—
4.33 „	710°	850°	—	—
4.36 „	1,110°	1,150°	100°	—
4.39 „	1,375°	1,400°	460°	—
4.42 „	1,440°	1,440°	740°	—
4.45 „	1,530°	1,530°	1,010°	105°
4.48 „	1,560°	1,550°	1,350°	1,140°
4.51 „	1,575°	1,575°	1,500°	1,210°
4.54 „	1,460°	1,500°	1,200°	1,100°

## Automatic Record at Point No. 5.

*July 11<sup>th</sup> 1900 Wood Doors.*



## DEAL LEDGED DOOR.

At 4.30 p.m. the gas was turned on.

*Observations on Inside.*

At 4.34 p.m. door blazing freely all over the surface, the face charred.

At 4.46 p.m. pieces of charred wood falling.

*Observations on Outside.*

At 4.31 p.m. smoke issuing between rebate of frame and top of door and down each side for about three feet.

At 4.34 p.m. flame appeared between rebate of frame and top of door at west corner.

At 4.38 p.m. flame extended all along top.

At 4.44 p.m. flame extending down each side of door and through joints, also glow along bottom.

## DEAL FOUR-PANEL DOOR.

At 4.30 p.m. the gas was turned on.

*Observations on Inside.*

At 4.34 p.m. door blazing freely all over the surface, the face charred.

At 4.43 p.m. pieces of charred moulding falling from the panels.

*Observations on Outside.*

At 4.31 p.m. smoke appeared between rebate of frame and top rail of door and down each side for about three feet.

At 4.38 p.m. resin flowing down top rail.

At 4.45 p.m. smoke came through between moulding and west style at top, with flame along top of door.

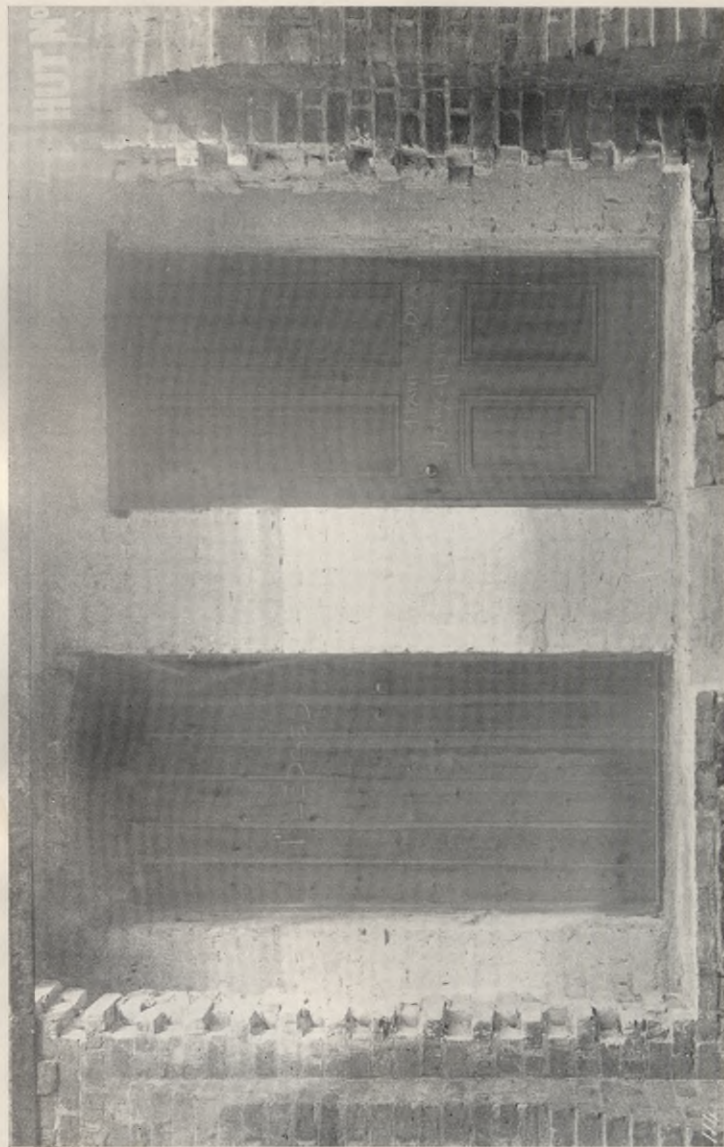


Fig. H. VIEW SHOWING CONDITION OF DOORS AFTER 5 MINUTES.



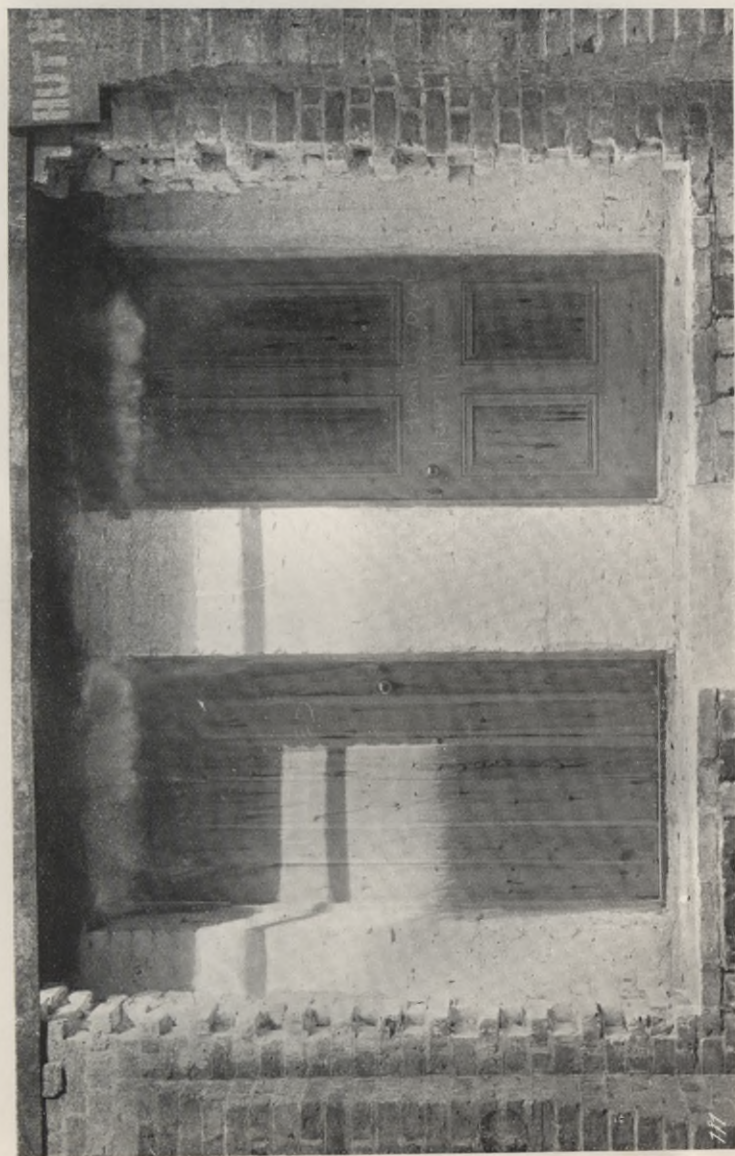
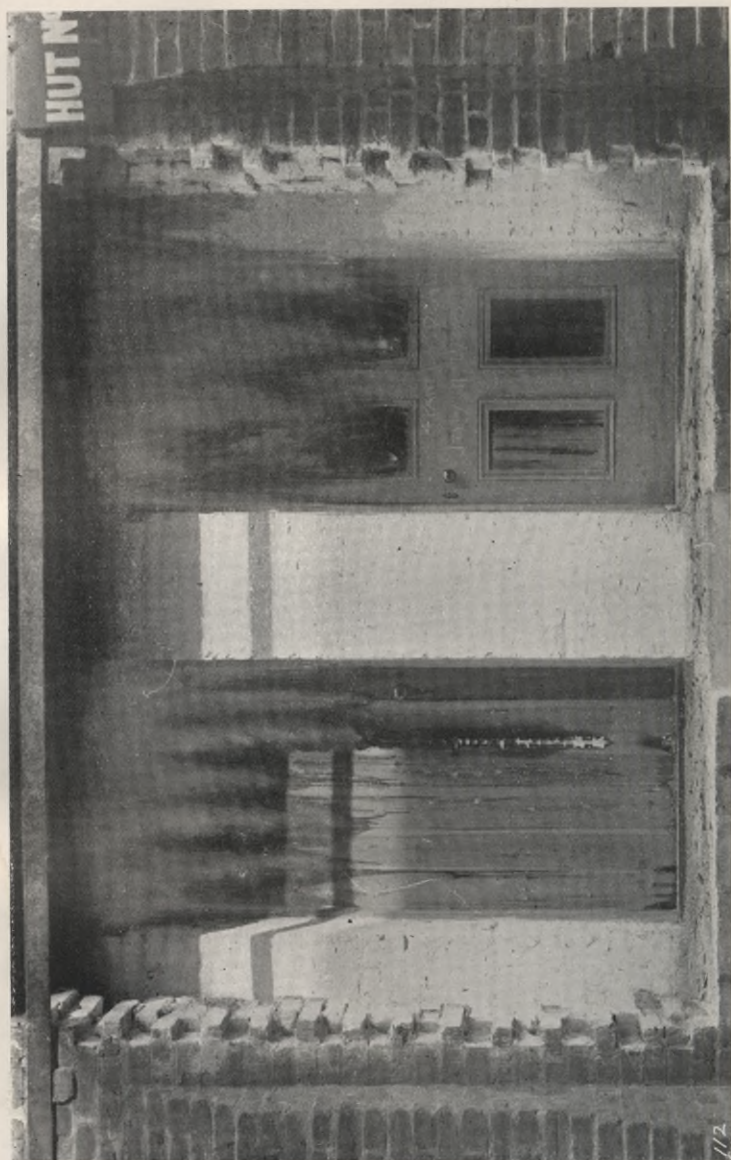


Fig. 1. VIEW SHOWING CONDITION OF DOORS AFTER 15 MINUTES.



*Fig. K.* VIEW SHOWING CONDITION OF DOORS AFTER 19 MINUTES.

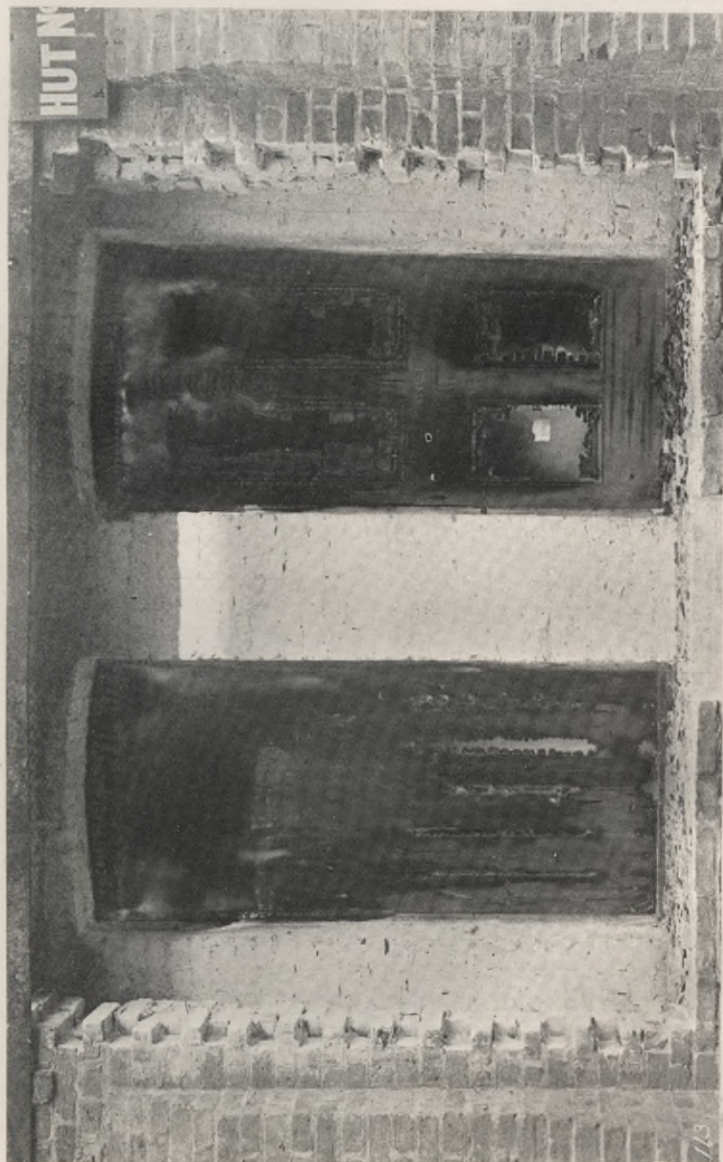


Fig. 1. VIEW SHOWING CONDITION OF DOORS AFTER 25 MINUTES.

DEAL LEDGED DOOR—*continued.*

At 4.47 p.m. glow seen through several joints.

At 4.51 p.m. the upper half of door fully alight, glow appearing through all joints in lower portion.

At 4.55 p.m. all joints open and blazing.

At 4.55 p.m. the gas was shut off.

At 4.57 p.m. water was applied and the test was closed.

DEAL FOUR-PANEL DOOR—*continued.*

At 4.46 p.m. flame appeared through top panels right and left.

At 4.48 p.m. holes burnt through top panels, lower panels charring.

At 4.50 p.m. the bottom left panel had flame through.

At 4.51 p.m. both lower panels in flame.

At 4.55 p.m. the gas was shut off.

At 4.57 p.m. water was applied and the test was closed.

## OBSERVATIONS AFTER TEST.

## DEAL LEDGED DOOR.

On July 12th the door and frame were still in position, but charred on the inside face ; also all vertical joints burnt through and the outer face of upper part much charred.

## DEAL FOUR-PANEL DOOR.

On July 12th the door and frame were still in position, but charred on the inside face, the panels being burnt out.

## GENERAL ARRANGEMENTS.

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

Mr. Ellis Marsland, District Surveyor, Camberwell,  
(Directing Member).

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

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

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

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

The Council was represented by:—

Mr. Arthur Cates, F.R.I.B.A., F.S.I., late Surveyor  
Crown Estates.

The Executive was represented by:—

Mr. Edwin O. Sachs (Chairman).

Mr. Chas. E. Goad, M.Am.Soc.C.E., M.Can.Soc.C.E.

Mr. T. E. Gatehouse, F.R.S.Ed., A.M.Inst.C.E.,  
M.I.M.E., M.Inst.E.E.

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

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

Mr. George E. Monckton, M.A.

The general body of members was represented by:—

Mr. F. Sizer Capon (Architect's Department, L.C.C.)

The following visitors attended by special invitation of the Executive :—

Mr. P. Blaschke, Mr. J. Burgess, Mr. H. A. Cheers, Mr. W. Fiddaman, Mr. E. J. A. Fulkes, Mr. Albert Gray, Lieut. P. S. Greig, R.E., Mr. G. F. Harrington, Mr. W. Hayne, Mr. J. Hurles, Mr. R. Morphew, Mr. C. Petri, Mr. E. Robins, Mr. P. Simpson, Mr. A. W. Smith and Sir George Thomas.

Signed,

*For the Sub-Committee conducting the Test :*

ELLIS MARSLAND.

*For the Commercial Section :*

FREDERIC R. FARROW.

*For the Executive :*

EDWIN O. SACHS.

Published by the Committee as directed by the Executive.

H. S. TAYLOR

(*Assistant Secretary*).

*Date—November 15th, 1900.*



FIG. 1. AFTER 64 MINUTES.



FIG. 2. AFTER 80 MINUTES.



FIG. 3. AFTER 89 MINUTES.



FIG. 4. AFTER 94 MINUTES.



FIG. 5. AFTER 100 MINUTES.



FIG. 6. AFTER 101 MINUTES.

