

# FIRE TESTS WITH DOORS.

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A  $2\frac{5}{8}$ -in. DOOR OF ARCHANGEL DEAL,  
CONSTRUCTED IN THREE THICKNESSES.

A  $2\frac{5}{8}$ -in. DOOR OF QUEBEC PINE,  
CONSTRUCTED IN THREE THICKNESSES.

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## Particulars

OF

EXPERIMENTAL FIRE TESTS.

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*ALL RIGHTS RESERVED.*

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LONDON, 1900.

PUBLISHED AT THE OFFICES OF  
THE BRITISH FIRE PREVENTION COMMITTEE  
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1, WATERLOO PLACE, PALL MALL.

*Two Shillings and Sixpence.*

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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.

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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 to be read as expressions of opinion, criticisms, or comparisons.*

## NOTE.

So much has been said regarding the advantages of doors constructed in three thicknesses of boarding that the Executive of this Committee decided to collect some data regarding their resistance. A series of such tests with such doors, constructed on different lines, of different materials, and hung in different ways, has now been commenced, and the present report is the first to be issued on this special subject.

Attention is called to the fact that the present report deals with doors which have not been hung in frames, but have been attached directly to the brickwork, so as to close into rebates.

Nails were used in the construction of these doors, and strap hinge was employed.

The materials in this case were deal and pine.

EDWIN O. SACHS.

LONDON,

*April 24th, 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.

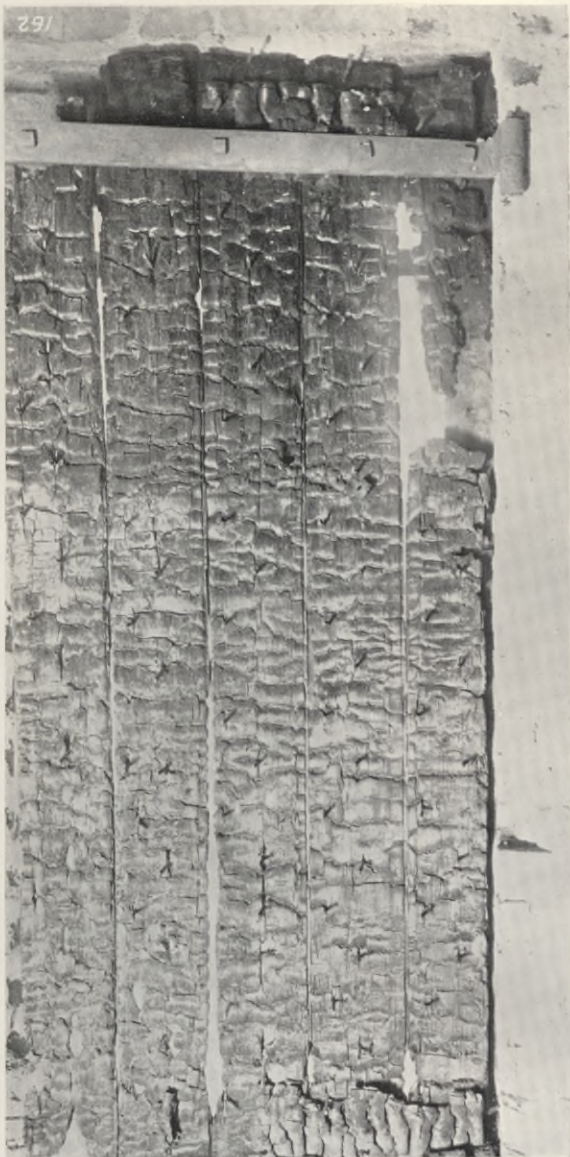
The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

*For the Executive,*

EDWIN O. SACHS, *Chairman.*







DEAL DOOR.



PINE DOOR.

*Fig. 8.* VIEW SHOWING CONDITION OF THE INSIDE OF THE DOORS AFTER THE TEST.



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

[FOUNDED 1897.—INCORPORATED 1899.]

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FIRE TEST BA & CA.—FEBRUARY 7TH, 1900.

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(Ba) A  $2\frac{5}{8}$  in. Door of Archangel Deal, constructed in  
Three Thicknesses.

(Ca) A  $2\frac{5}{8}$  in. Door of Quebec Pine, constructed in  
Three Thicknesses.

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OBJECT OF TEST.

To record the effect of a fierce fire of one hour, gradually increasing to a temperature of  $2,000^{\circ}$  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 DOOR.

In 39 minutes flame appeared over the top intermittingly.

In 42 minutes flame also appeared down west side about 12 in.

In 55 minutes flame came continuously through the upper portion of door.

In 65 minutes the upper portion of door was considerably burnt and flame was seen through several small holes burnt in the lower portion of the door.

## PINE DOOR.

In 52 minutes no flame had come through the door or from the joints around same, although much smoke had come from the joints, and the wood around all the bolts and nails was much scorched.

In 60 minutes flame came over the top of door and also through its upper part in several places.

In 70 minutes, after water had been applied, the two inner thicknesses of the door were found practically burnt away and the outer thickness (which was for the most part in position) much damaged.

## DESCRIPTION OF THE TESTING PLANT.

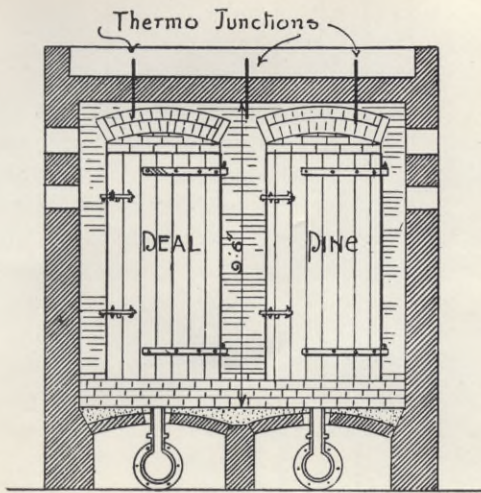
(See *Figs. A, B, C and D.*)

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

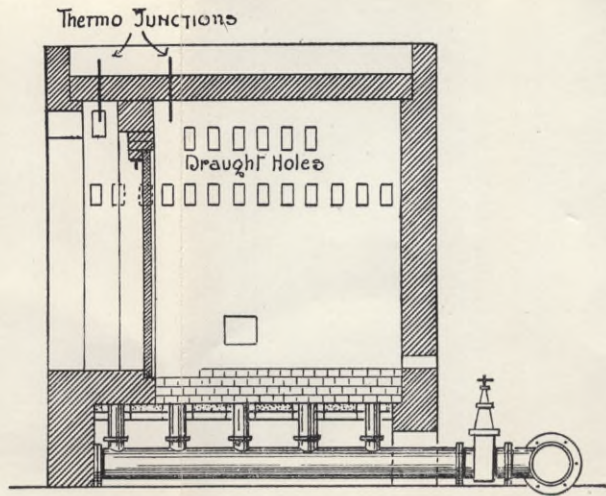
The hut was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

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.

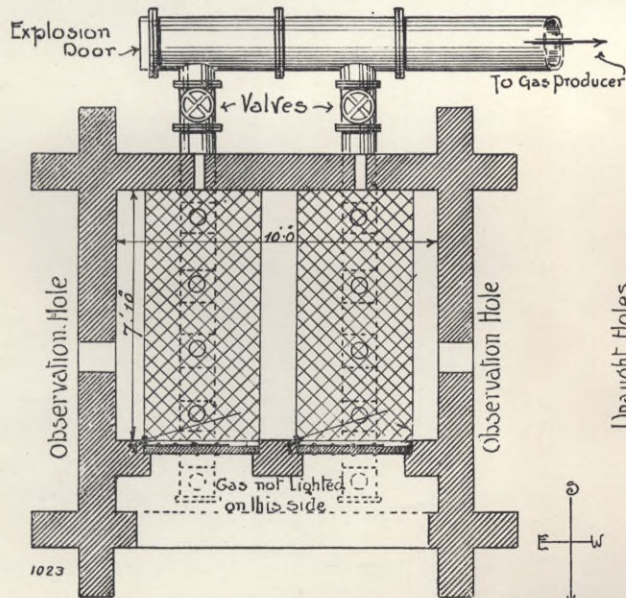




SECTION LOOKING NORTH

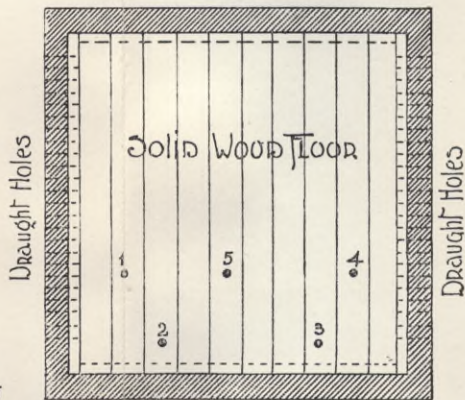


SECTION LOOKING EAST



PLAN OF HUT

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





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

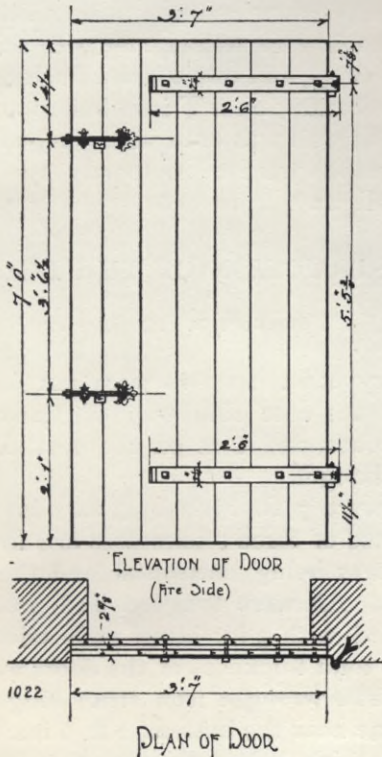


Fig. E. DETAIL OF DOORS.

points Nos. 1, 2, 3 and 4, points Nos. 2 and 3 being outside the doors, and the others on the fire side of the 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.

A brick wall, 14 in. thick, with two openings 3 ft. 3 in. wide, 6 ft. 9 in. 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 the floor and the ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half brick rings, and one course of bricks were put in below the arch resting on a T iron built into the wall at both ends. The wall was built with gauged stuff.

The photographs were taken partly by daylight and partly by flashlight.

## CONSTRUCTION OF THE DOORS.

(See Figs. E, G.)

On February 6th the doors were put into position. The door on the east side was of Canadian yellow pine from Quebec, and that on the west side of yellow deal from Archangel.

The doors were 7 ft. high by 3 ft. 7 ins. wide; they were constructed of three thicknesses of  $\frac{7}{8}$  in. boards, the middle thickness being horizontal and the outer ones being vertical. All were tongued and grooved on the solid and nailed with 3 in. clasp nails clinched on the outside. The total thickness of the doors was  $2\frac{5}{8}$  ins.

Each door had wrought iron strap hinges, one near the top and one near the bottom, 2 ft. 6 ins. long,  $2\frac{1}{4}$  ins. wide and  $\frac{3}{8}$  in. thick, bolted through the door with four  $\frac{3}{8}$  in. iron bolts. The hinges turned on wrought iron pins, the ends of which were built into the walls. On each door were fixed two wrought iron latches, one near the top and one near the bottom, with wrought iron catches built into the walls.

The doors were hung in brick rebates and before they



were put into position the rebates were screeded with plaster mixed with lime mortar.

The doors fitted closely against the screeds, and the joint between the door and the brickwork was pointed on the outside immediately before the test.



*Fig. G.* VIEW SHOWING DOORS FROM OUTSIDE BEFORE THE TEST.

### THE TEST.

(See *Figs. I to 12 and H to N.*)

On February 7th, 1900, the test was undertaken.

The following is a 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, cloudy ; Wind, N. ; Barometer, 29.69 in. ; Attached thermometer, 44° Fahr. ; Dry bulb, 36.7° Fahr. ; Wet bulb, 34.2° Fahr. ; Remarks, fine afternoon.

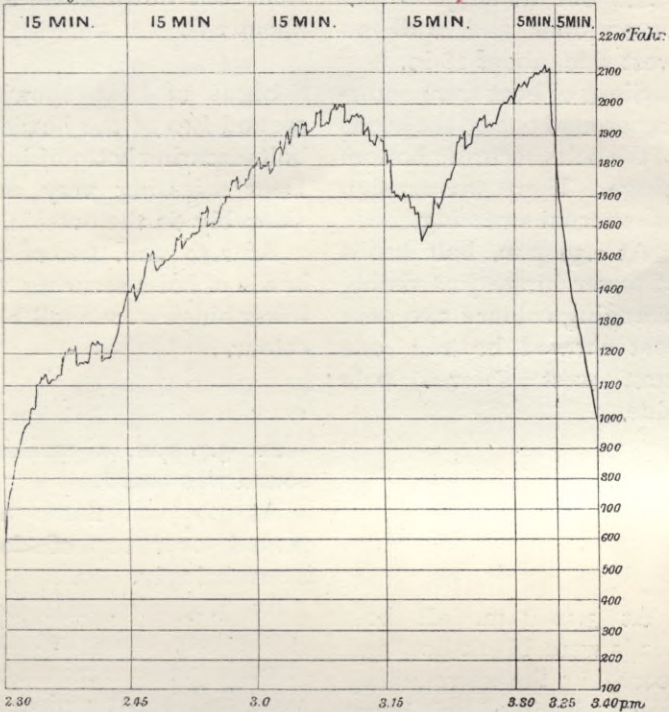
The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4, and the diagram below shows the continuous record from Point No. 5.

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

*From 2.30 p.m. to 3.35 p.m.*

TIME.	INSIDE.		OUTSIDE.	
	No. 1. Fahr.	No. 4. Fahr.	No. 2. Fahr.	No. 3. Fahr.
2.30 p.m.	250°	300°	—	—
2.33 "	760°	900°	—	—
2.36 "	1,050°	1,150°	—	—
2.39 "	1,175°	1,210°	—	—
2.42 "	1,200°	1,240°	—	—
2.45 "	1,275°	1,350°	—	—
2.48 "	1,420°	1,500°	—	—
2.51 "	1,500°	1,560°	—	—
2.54 "	1,590°	1,650°	—	—
2.57 "	1,620°	1,780°	—	—
3.0 "	1,740°	1,780°	—	—
3.3 "	1,760°	1,820°	—	—
3.6 "	1,900°	1,910°	—	—
3.9 "	1,950°	1,940°	—	—
3.12 "	1,880°	1,950°	—	—
3.15 "	1,800°	1,925°	—	—
3.18 "	1,670°	1,720°	—	—
3.21 "	1,600°	1,600°	—	—
3.24 "	1,840°	1,880°	102°	213°
3.27 "	1,950°	1,950°	100°	345°
3.30 "	2,000°	2,000°	250°	550°
3.33 "	2,100°	2,080°	820°	800°
3.36 "	2,100°	2,060°	850°	960°

## AUTOMATIC RECORD AT POINT NO. 5.

February 7<sup>th</sup> 1900.

PINE DOOR.

DEAL DOOR.

*Observations on the Outside.**Observations on the Outside.*

At 2.30 p.m. the gas was lighted.

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At 2.32 p.m. smoke came through the joint between top of door and wall. This continued without intermission throughout the test.

At 2.32 p.m. smoke came through the joint between the top of door and wall. This continued without intermission throughout the test.



PINE DOOR—*continued.*

At 2.50 p.m. smoke also came out down joint between door and wall on west side, about 18 in.

Signs of heat were showing around one of the heads of the bolts securing bottom hinge. There was no sign of external sweating.

At 2.59 p.m. bolt heads of lower hinge just visibly changing colour; two next east showed brown; one next west showed pale blue.

At 3.10 p.m. all bolt heads were black hot, and scorching the surrounding wood. Head of bolt burnt a piece of paper when applied. Outer face of the door was dry. The joints generally were  $\frac{1}{2}$  in. open.

At 3.12 p.m. all the clinched ends of the nails used in the door were scorching the boards on outside face.

DEAL DOOR—*continued.*

At 2.50 p.m. smoke also came out down each side about 2 ft.

Signs of heat showing around two of the heads of bolts securing bottom hinge. Door sweating very considerably on the outside.

At 2.59 p.m. two of the heads of bolts securing the lower hinge were a full blue colour.

At 3.7 p.m. a creaking sound was heard.

At 3.9 p.m. flame appeared over top of door intermittingly.

At 3.10 p.m. All bolt heads were black hot and scorching the surrounding wood and burnt a piece of paper when applied. The outer face of the door was dry, and the joints generally were  $\frac{1}{2}$  in. open.

At 3.12 p.m. flame appeared at west top corner, about 12 ins. at top and 12 in. at side intermittingly. Wood adjoining west bolt of bottom hinge showed fire above and below it. All the clinched ends

PINE DOOR—*continued.*

At 3.13 p.m. smoke was coming from the scorched wood around bolts to lower hinge.

At 3.20 p.m. no sign of flame around door, but the wood around bolts and nails much scorched.

At 3.22 p.m. no sign of flame, but increasing scorching of the wood on outer face of door.

At 3.30 p.m. flame came through the joint at top, down west side, and also bursting out through the upper part of door in several places. No sign of burning round bolts of lower hinge.

DEAL DOOR—*continued.*

of the nails used in the door were scorching the boards on the outside face.

At 3.13 p.m. smoke came from the scorched wood around bolts to lower hinge.

At 3.18 p.m. the fire around west bolt, lower hinge, had burnt the hole upwards and downwards, and this hole was extending.

At 3.22 p.m. the flame was increasing along top of door and down joint on west side.

At 3.25 p.m. flame came through joint all along top and down west side nearly half way, and also through upper portion of door west of centre. Also at bottom by west bolt and at four other small points.

PINE DOOR—*continued.*

At 3.34 p.m. the flames coming through the holes burnt in several parts of the door had greatly increased, and a number of smaller holes had been burnt through the whole thickness.

At 3.35 p.m. the gas was shut off.

At 3.37 p.m. water was applied to the outer face of door for one minute.

## PINE DOOR.

*Observations on Inside.*

At 2.36 p.m. the face of the door was blazing freely all over, except a very small portion at the bottom on west side.

At 3.2 p.m. small pieces of the inner thickness of the door were falling off at bottom.

At 3.6 p.m. bolts and catches of latches bright red hot.

DEAL DOOR—*continued.*

At 3.34 p.m. the flames coming through the holes burnt in several parts of the door had greatly increased, and a number of smaller holes had been burnt through the whole thickness.

At 3.35 p.m. the gas was shut off.

At 3.37 p.m. water was applied to the outer face of door for one minute.

## DEAL DOOR.

*Observations on Inside.*

At 2.36 p.m. the face of the door blazing freely all over, except a small portion at the bottom on east side.

At 3.2 p.m. pieces of the inner thickness of the door were falling off in several places.

At 3.6 p.m. bolts and catches of latches bright red hot.



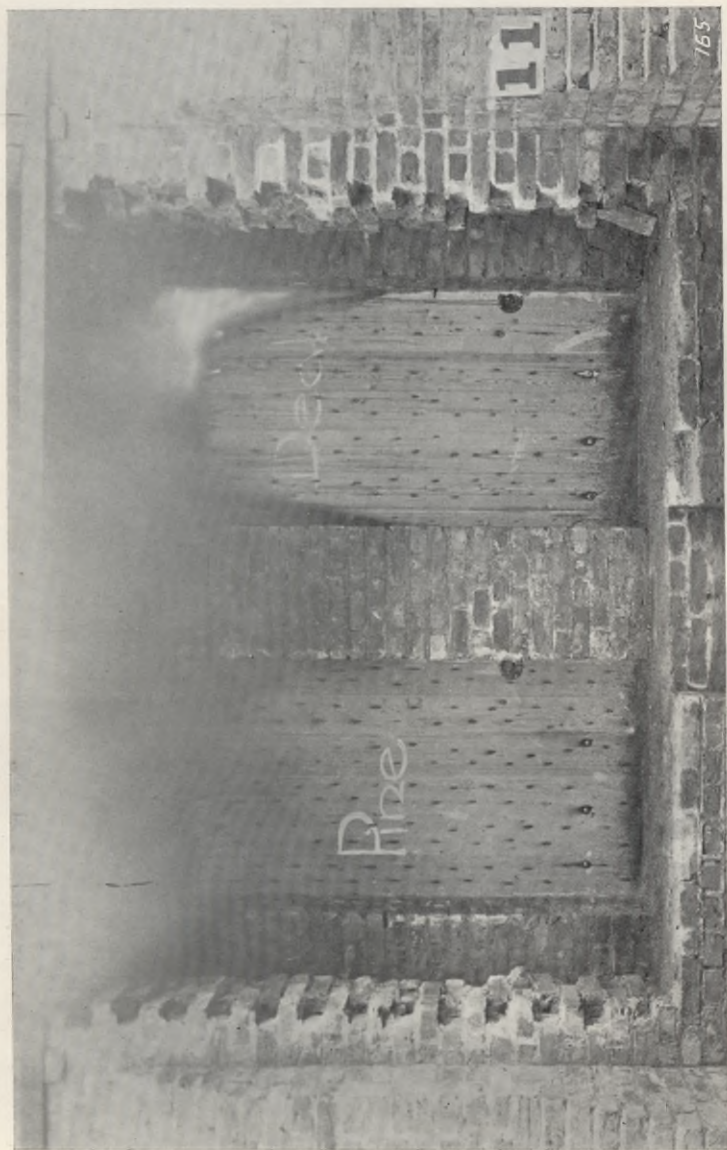


Fig. H. VIEW SHOWING CONDITION OF DOORS AFTER 55 MINUTES.

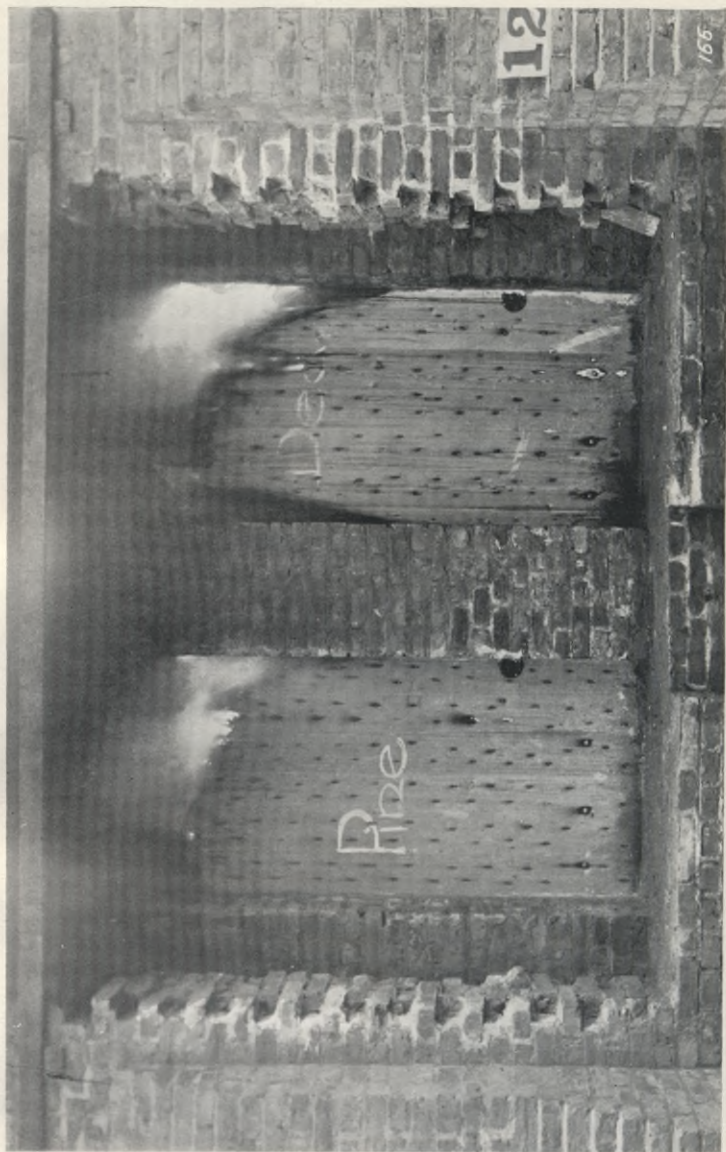


Fig. J. VIEW SHOWING CONDITION OF DOORS AFTER 60 MINUTES.

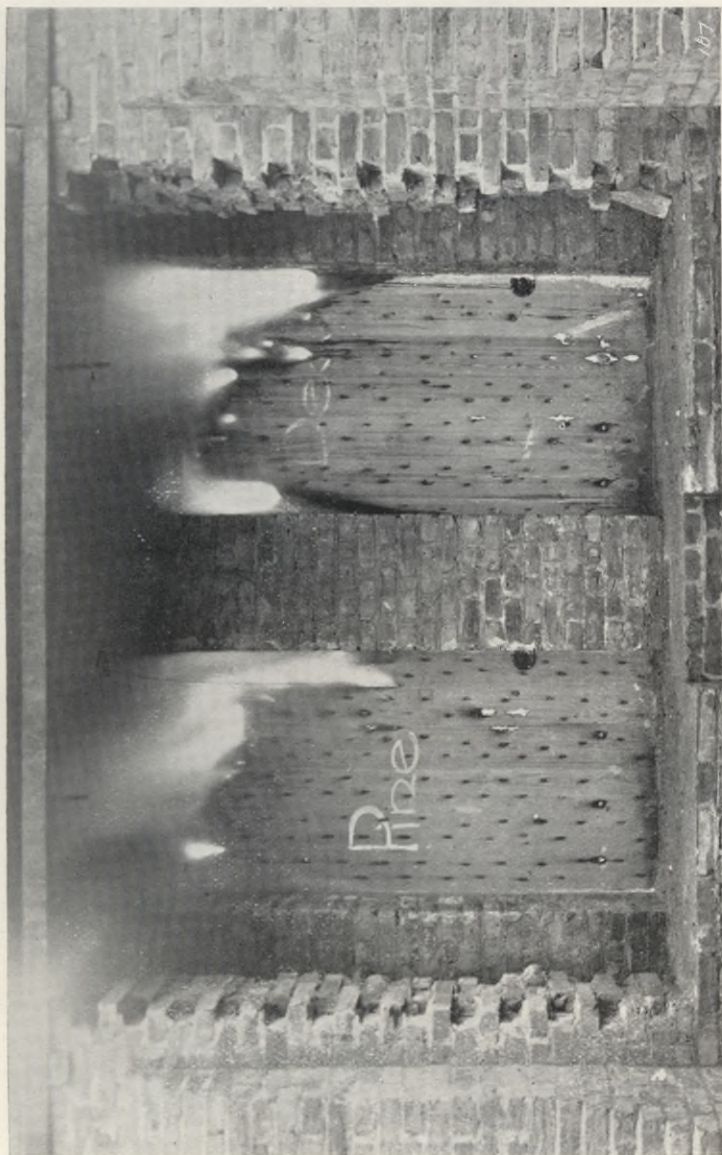


Fig. K. VIEW SHOWING CONDITION OF DOORS AFTER 63 MINUTES.



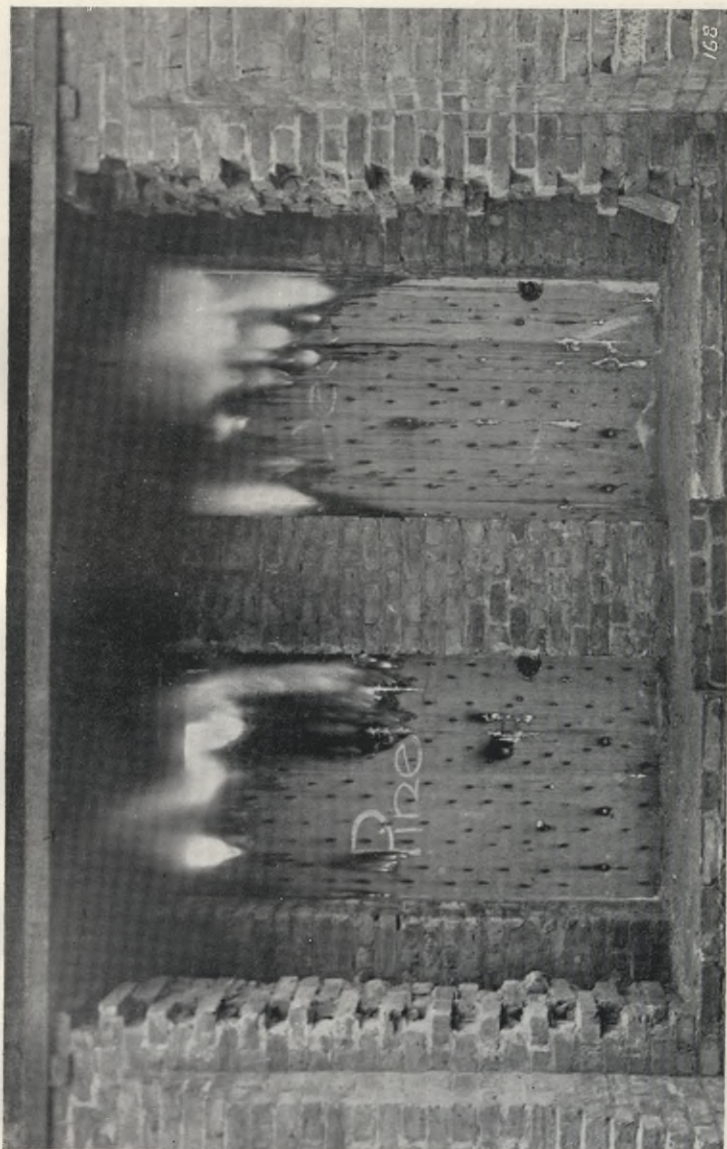


Fig. L. VIEW SHOWING CONDITION OF DOORS AFTER 65 MINUTES.

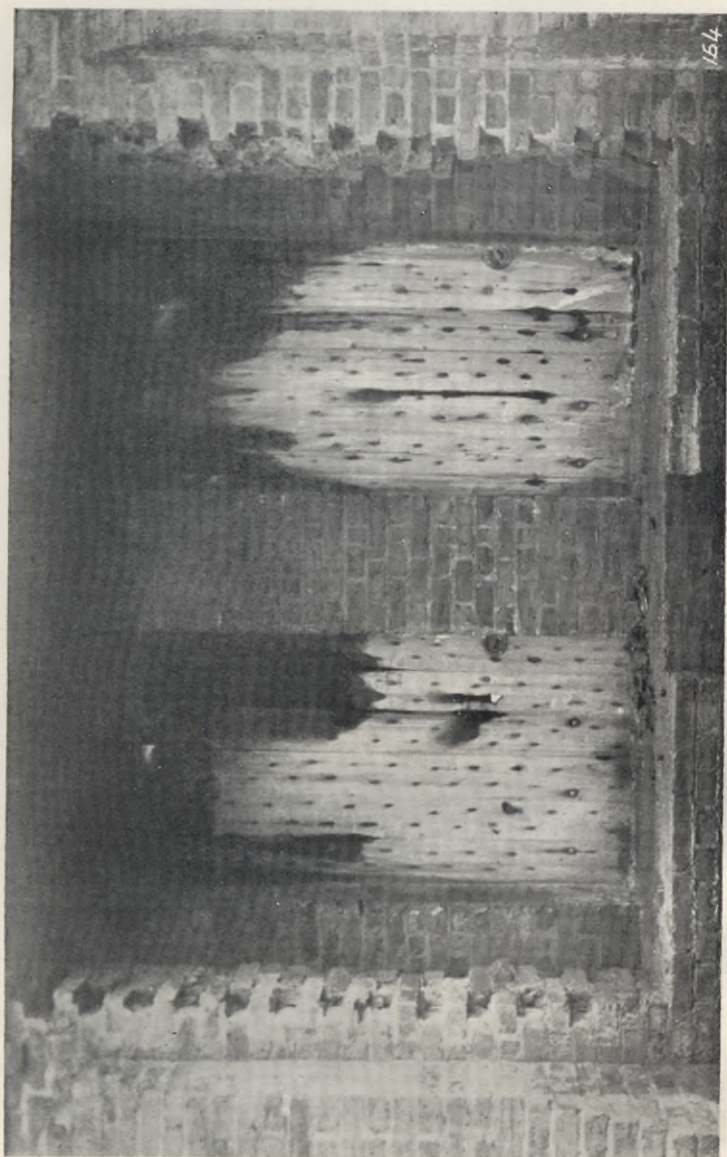


Fig. M. VIEW SHOWING CONDITION OF DOORS AFTER THE APPLICATION OF WATER. (3.39 P.M.)

## 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, comprising :—

Mr. Max Clarke, A.R.I.B.A. (Directing Member).  
 Mr. Ellis Marsland, District Surveyor, Camberwell.  
 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 the instrument room.

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 Mr. H. H. Collins, F.R.I.B.A., F.S.I., Past President,  
 District Surveyors' Association.

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 Mr. C. Petri (The Mural Decoration Syndicate).  
 Mr. H. B. Tarry (The British Uralite Co.).  
 Mr. F. Wallers (Dowson, Taylor & Co.).  
 Mr. G. A. Williams (Messrs. G. A. Williams & Son).



The general body of members was represented by:—

- Mr. Arthur Crow, A.R.I.B.A. (District Surveyor, Whitechapel).
- Mr. Bernard Dicksee, A.R.I.B.A. (District Surveyor, E. Newington).
- Mr. E. Dru Drury, F.R.I.B.A., F.S.I. (District Surveyor, St. Margaret's).
- Mr. W. Grellier, F.R.I.B.A. (District Surveyor, Clapham).
- Mr. F. W. Hamilton, F.R.I.B.A. (District Surveyor, North Fulham).
- Mr. A. J. Handford (Surveyor).
- Mr. E. R. Hewitt, A.R.I.B.A. (District Surveyor, St. Saviour's).
- Mr. Geo. McDonell, A.R.I.B.A. (District Surveyor, Islington).
- Mr. Hugh McLachlan, A.R.I.B.A. (District Surveyor, West Division City of London).
- Mr. S. F. Monier-Williams, A.R.I.B.A. (District Surveyor, South Fulham).
- Mr. R. Notley, F.R.I.B.A., F.S.I. (District Surveyor, Bethnal Green).
- Mr. L. E. Aulagnier (Westminster Fire Office).
- Mr. A. Saxon-Snell, A.R.I.B.A.
- Mr. George Tolley.

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

- Mr. H. L. Cunnah; Mr. Matt Garbutt, A.R.I.B.A., A.M.I.C.E.; Mr. F. G. Hamilton (Royal Exchange Assurance); Mr. H. King (Royal Exchange Assurance); Mr. T. Nicholls; Mr. Geo. Pritchard; Mr. W. A. Scott.

Signed,

*For the Sub-Committee conducting the Test :*

MAX CLARKE (*Directing Member*).

*For the Commercial Section :*

FREDERIC R. FARROW.

*For the Executive :*

EDWIN O. SACHS (*Chairman*).

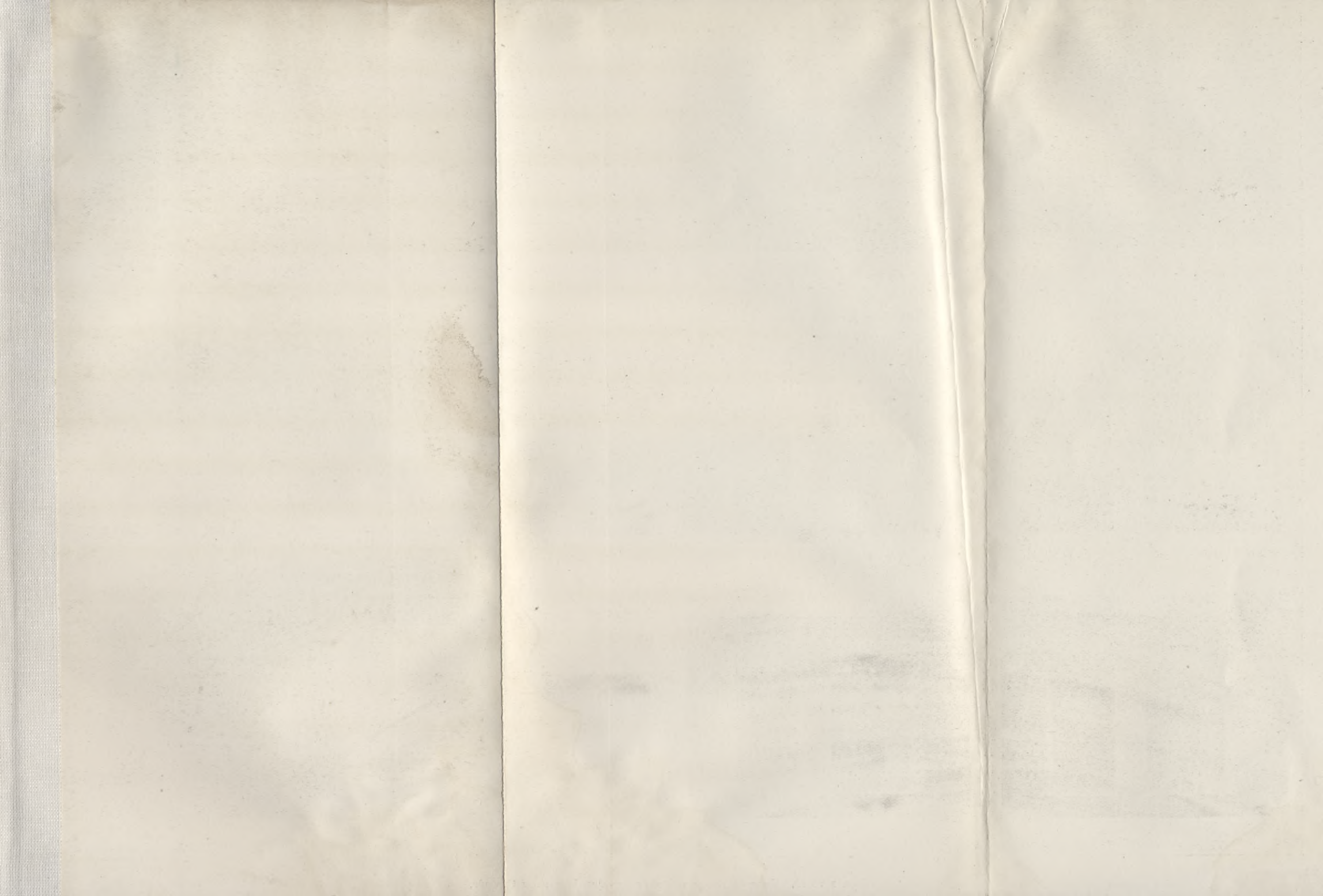
Published by the Committee  
as directed by the Execu-  
tive.

H. S. TAYLOR

(*Assist. Secretary*).

*Date—April 24th, 1900.*







TEAK DEAL



FIG 1 TEMP 125° TIME 2.42pm

TEAK DEAL



FIG 2 TEMP 1100° TIME 2.47pm

TEAK DEAL



FIG 3 TEMP 1250° TIME 2.52pm

TEAK DEAL



FIG 4 TEMP 1380° TIME 2.57



FIG 5 TEMP 1290° TIME 3.2pm



FIG 6 TEMP 1400° TIME 3.7pm



FIG 7 TEMP 1535° TIME 3.12pm



FIG 8 TEMP 1600° TIME 3.17pm



FIG 9 TEMP 1700° TIME 3.22pm



FIG 10 TEMP 1820° TIME 3.27pm



FIG 11 TEMP 1850° TIME 3.32pm



FIG 12 TEMP 1800° TIME 3.37pm