

FIRE TESTS WITH DOORS.

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

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

Particulars
OF
EXPERIMENTAL FIRE TESTS.

ALL RIGHTS RESERVED.

LONDON, 1899.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
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Two Shillings and Sixpence.

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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 here under consideration again deals with doors, and should be read in connection with the other reports of this series of investigations.

The report, of course, speaks for itself; but I think I should specially point out that both doors in this test opened inwards, *i.e.*, towards the fire, as was the case with the iron and with the armoured wood door dealt with in Publication No. 25; whilst the small doors reported on in Publication No. 24 opened outwards, *i.e.*, away from the fire.

One word, however, as to the arrangement of this report. The method of showing instantaneous views, as tried in Publication No. 24, has been developed in this instance; for the Committee presents not only a series of small views taken every few minutes, but also some large photographs taken at different intervals. The large photographs allow for the more detailed study of the effect of the fire; whilst the small photographs, arranged on one plate, are intended to give a picture of the gradual progress of the test. The Committee are indebted for these arrangements to Mr. Ellis Marsland, who has given the photographic details of the testing operations considerable attention.

Another new feature in the report is the arrangement of the log of the test in two columns, so that the particulars given regarding the two doors can be seen side by side

EDWIN O. SACHS.

September 25th, 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.*

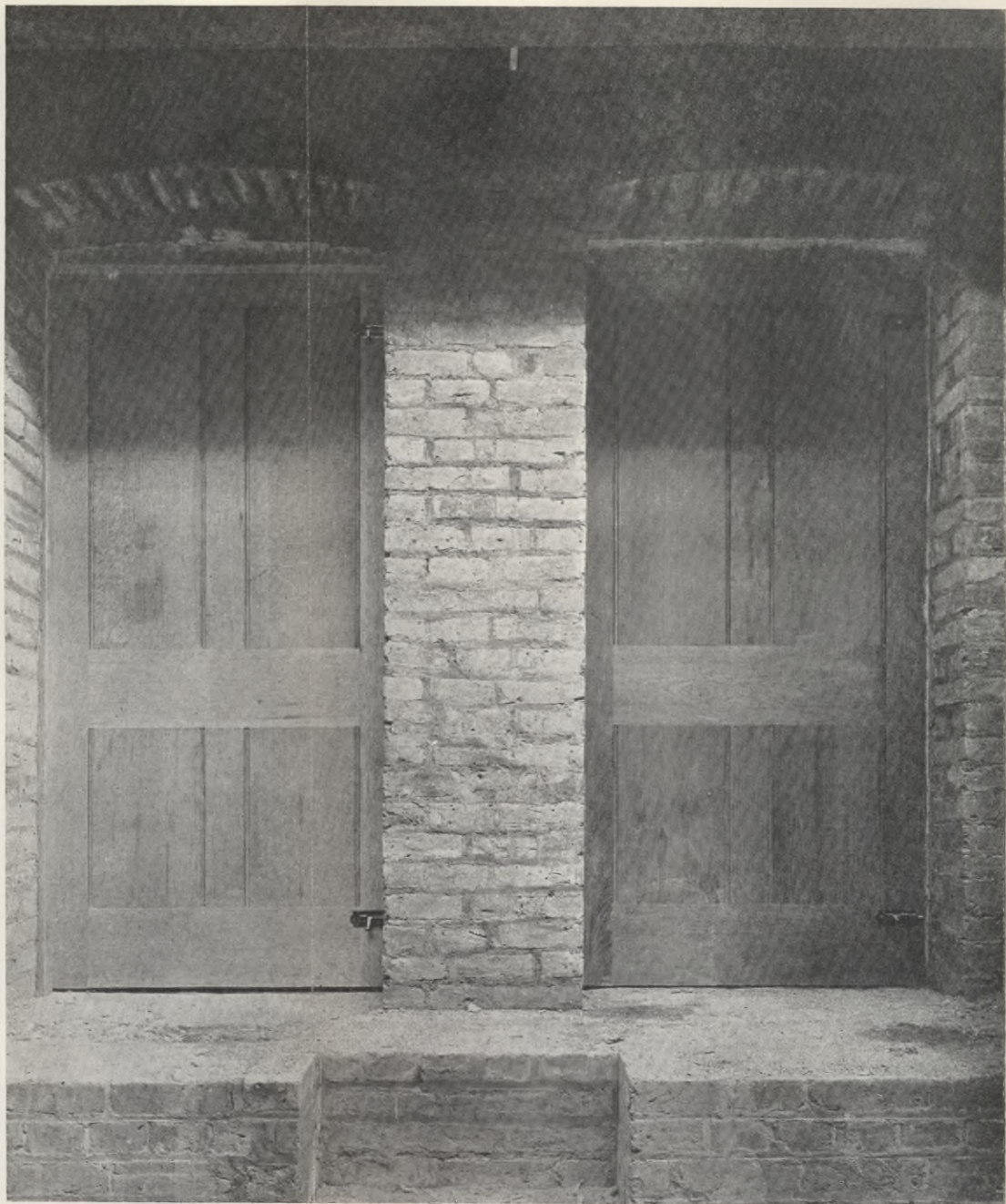


Fig. C. VIEW SHOWING DOORS FROM OUTSIDE BEFORE COMMENCEMENT OF TEST.

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

[FOUNDED 1897.—INCORPORATED 1899.]

FIRE TESTS, M AND N, JULY, 5TH, 1899.

M.—A 2-in. Framed Oak Door with 2-in. Solid Panels.

N.—A 2-in. Framed Teak 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 30 minutes flame appeared between frame and top rail of door on east side.

In 40 minutes flame appeared between upper panel and style on west side.

In 44 minutes the flame came through lock rail.

In 55 minutes the 4 panels fell outwards.

In 59 minutes remainder of the door collapsed and fell outwards.

TEAK DOOR.

In 5 minutes flame appeared between frame and top rail on side of slamming style, and gradually extended along top edge and down top rail and panels.

In 55 minutes the fire had extended to the bottom of top panels, and flame was coming through joints between muntin and lower panels.

In 58 minutes the door collapsed and fell 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 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 8 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.

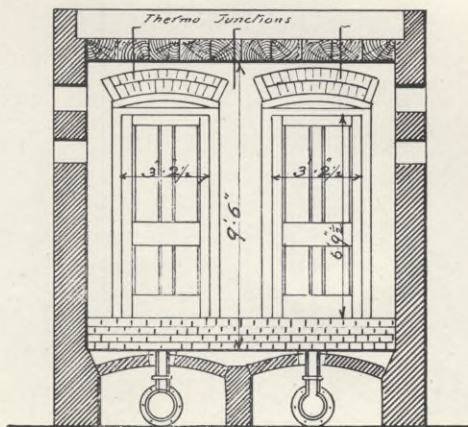
Two Roberts-Austen pyrometers were used for recording temperatures, to take five observation records from points Nos. 1, 2, 3, 4, 5; point 3 being outside the doors, and the others on the fire side of doors. See roof plan.

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

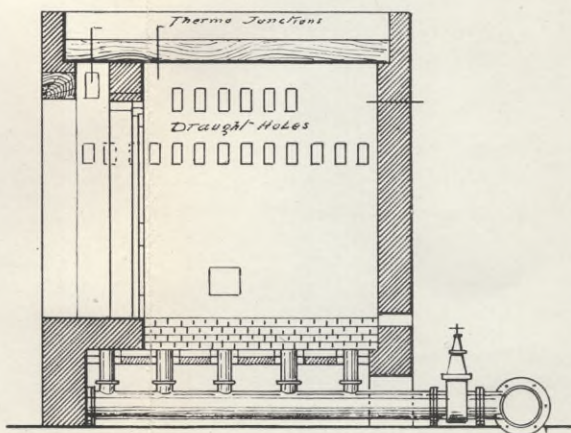
The draught holes were in the east and west walls.

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

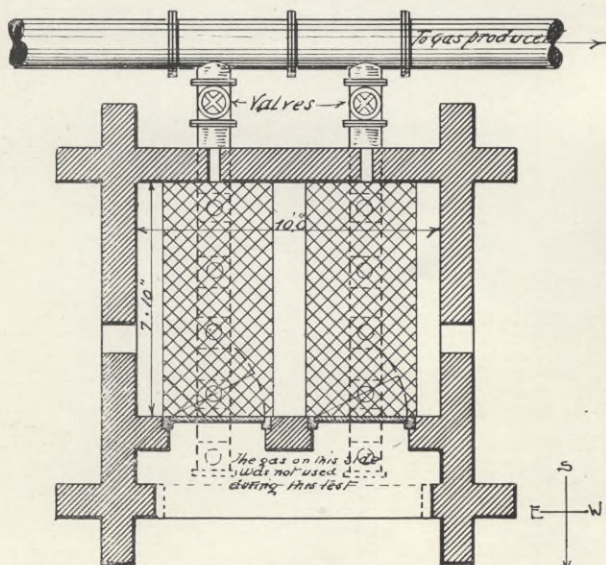
A brick wall 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from east to west. It was built 15 in. back from the main



SECTION LOOKING NORTH

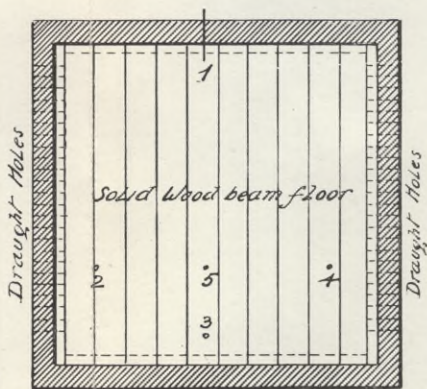


SECTION LOOKING EAST



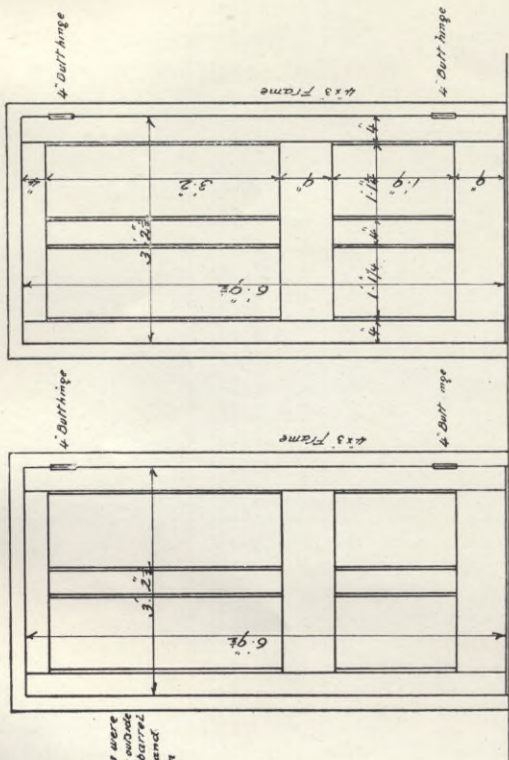
PLAN OF HUT

Note points marked 1.2.3.4.5
are Thermo Junctions attached to
Wires leading to pyrometers
That marked 5 is self-recording

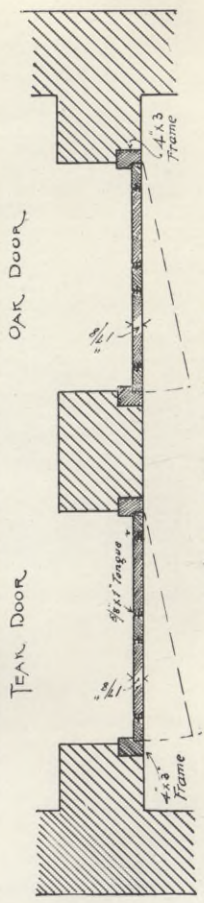


PLAN OF ROOF

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



The doors were
 built on outside
 with a 6" barrel
 butt top and
 bottom



DETAILS OF DOORS. Figs. E, F.

wall. The wall was carried up to the ceiling, the height between floor and ceiling being 8 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 to G*).

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

The door was constructed of 2-in. oak, 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 TEAK DOOR.

The teak door was of Moulmein teak, and was similarly constructed and hung.

Note.—The doors and frames were fixed in the hut on July 4th. The oak door on the east side, and the teak 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 July 5th photographs were taken of the two doors from the outside. (See Fig. G).

THE TEST.

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

On July 5th 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, cloudy; rain, none; wind, N.W.; barometer, 30.20 ins.; attached thermometer, 66° Fahr.; dry bulb, 71° Fahr.; wet bulb, 62.2° Fahr.

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

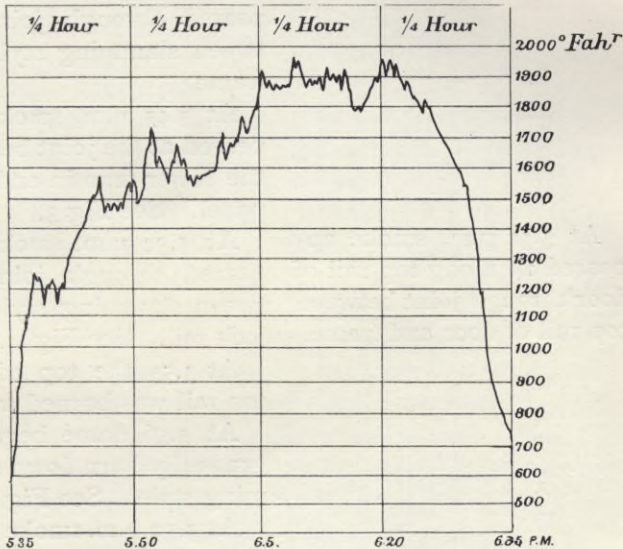
OBSERVATIONS TAKEN AT POINTS, 1, 2, 3, 4.

(From 5.35 p.m. to 6.35 p.m.)

TIME.	INSIDE.			OUTSIDE.
	No. 1. Fahr.	No. 2. Fahr.	No. 4. Fahr.	No. 3. Fahr.
5.35 p.m.	610°	600°	750°	—
5.40 „	1,110°	1,170°	1,250°	100°
5.45 „	1,350°	1,410°	1,490°	180°
5.50 „	1,400°	1,450°	1,500°	225°
5.55 „	1,470°	1,540°	1,550°	250°
6.0 „	1,535°	1,590°	1,625°	275°
6.5 „	1,700°	1,750°	1,810°	465°
6.10 „	1,780°	1,825°	1,870°	1,000°
6.15 „	1,700°	1,770°	1,750°	1,025°
6.20 „	1,790°	1,800°	1,780°	975°
6.25 „	1,750°	1,740°	1,700°	1,315°
6.30 „	1,350°	1,400°	1,415°	1,000°
6.35 „	Broken.	750°	Broken.	350°

Note.—It will be seen that the temperatures at point No. 4, which was opposite the teak door, are generally slightly in excess of those at Point No. 2, opposite the oak door.

AUTOMATIC RECORD AT POINT No. 5.



THE TEST (continued).

OAK DOOR.

At 5.30 p.m. the gas was turned on.

Observations on Outside.

At 5.35 p.m. smoke appeared through joint between frame and top rail of door at the right hand corner.

TEAK DOOR.

At 5.30 p.m. the gas was turned on.

Observations on Outside.

At 5.35 p.m. dense smoke appeared through joint between frame and top rail of door, also some flame. See Fig. 1.

At 5.37 p.m. flame appeared through the joint between frame and top rail of door, extending to about half the width of top rail. See Fig 2.

OAK DOOR—*continued.*

At 5.52 p.m. smoke appeared all along top rail of door through joint between top rail of door and frame.

At 6.5 p.m. flame appeared over top rail of door at the east corner. See Fig. 7.

TEAK DOOR—*continued.*

At 5.43 p.m. smoke appeared through joint between slamming style and frame.

At 5.45 p.m. smoke appeared at the joint between the lower muntin and west panel. See Fig. 3.

At 5.52 p.m. smoke appeared through joint between slamming style and lock rail. See Fig. 4.

At 5.55 the top edge of top rail was burned away.

At 5.56 flame began to gradually burn down slamming style. See Fig. 5.

At 5.59 p.m. smoke came through joint at junction of muntin and top rail to the right, and flame began to work down the hanging style. See Fig. 6.

At 6.0 p.m. flame gradually working down top rail.

At 6.2 p.m. smoke came through joint at junction of muntin and top rail to the left.

At 6.4 p.m. flame spreading down top panels. See Fig. 7.

At 6.6 p.m. the whole top rail of door and head of frame well alight, and the flame still spreading down panels.

OAK DOOR—*continued.*

At 6.9 p.m. flame came through joint between slamming style and panel, about 7 ins. above centre rail.

At 6.12 p.m. upper panels and muntin bulging outwards.

At 6.14 the lock rail burnt through and flame extending up joint between slamming style and panel. See Fig. 9.

At 6.20 p.m. whole of top rail of door well alight, the fire through lock rail extending. Fire also coming through on each side of centre style at bottom. See Fig. 10.

At 6.23 p.m. the whole of the upper part of door from lock rail burning freely. Bottom rail burnt upwards for about three inches.

At 6.25 p.m. the four panels fell outwards, the lock rail burning but still in position.

At 6.29 p.m. styles and rails collapsed.

TEAK DOOR—*continued.*

At 6.9 p.m. flame still extending down panels to an extent of about 9 ins. See Fig. 8.

At 6.12 p.m. upper panels and muntin bulging outwards.

At 6.14 p.m. fire showing through joints between frame and slamming and hanging styles at bottom. See Fig. 9.

At 6.19 p.m. flame extending down upper panels of door to an extent of about 18 ins., and top rail of door partly gone. See Fig. 10.

At 6.23 p.m. the whole of top rail of door consumed. See Fig. 11.

At 6.25 p.m. flame extending down upper panels and muntin burning on both edges from the bottom.

At 6.27 p.m. muntin well alight.

At 6.28 p.m. the door collapsed, falling inwards. See Fig. 12.

OAK DOOR—*continued.**Observations on Inside.*

At 5.35 p.m. door caught fire.

At 5.40 p.m. door charred and incandescent, but not flaming.

At 5.43 p.m. door flaming slightly, and draught drawing under bottom rail.

At 5.46 p.m. door flaking considerably and flaming at bottom.

At 5.50 p.m. door flaming at bottom and half way up.

At 5.53 p.m. door flaming all over.

At 6 p.m. door flaking freely, flaming slightly at lower portion.

At 6.6 p.m. door flaming freely and flaking.

At 6.15 p.m. door flaming freely and flaking.

TEAK DOOR—*continued.**Observations on Inside.*

At 5.36 p.m. door caught fire.

At 5.40 p.m. whole surface of door alight.

At 5.43 p.m. draught drawing over top rail of door.

At 5.46 p.m. door flaming all over.

At 6 p.m. door flaming freely all over.

At 6.15 p.m. door flaming freely.

TEAK DOOR.

OAK DOOR.

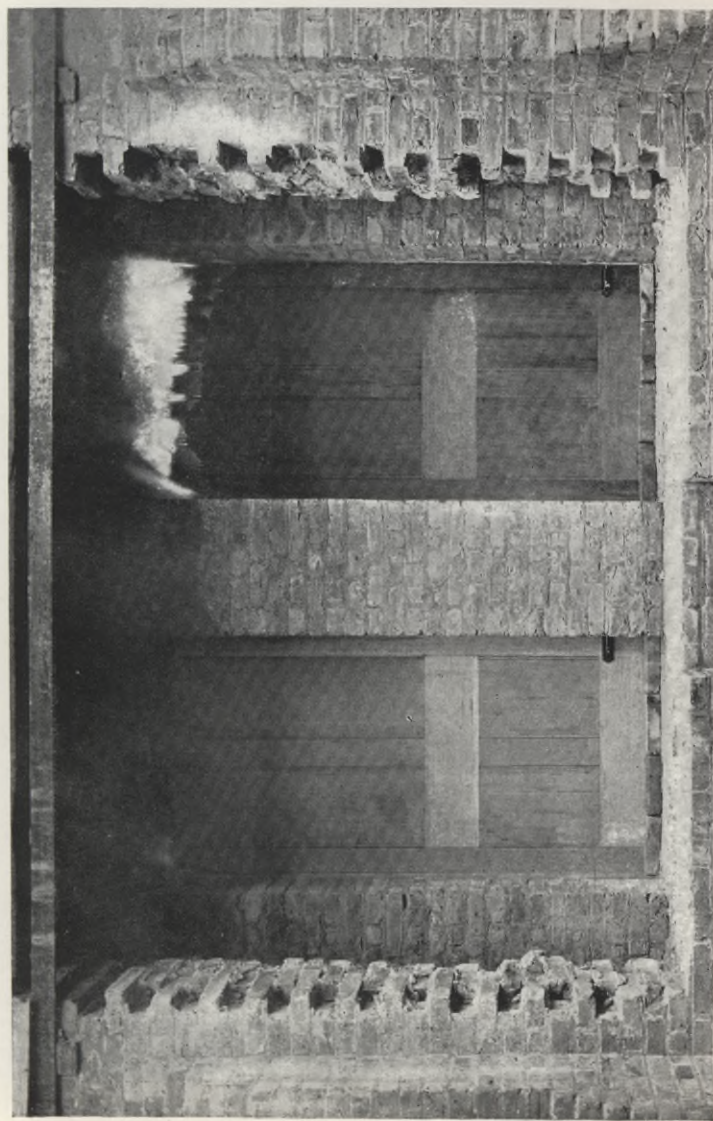


Fig. H. VIEW SHOWING CONDITION OF DOORS AFTER 35 MINUTES.

OAK DOOR.

TEAK DOOR.

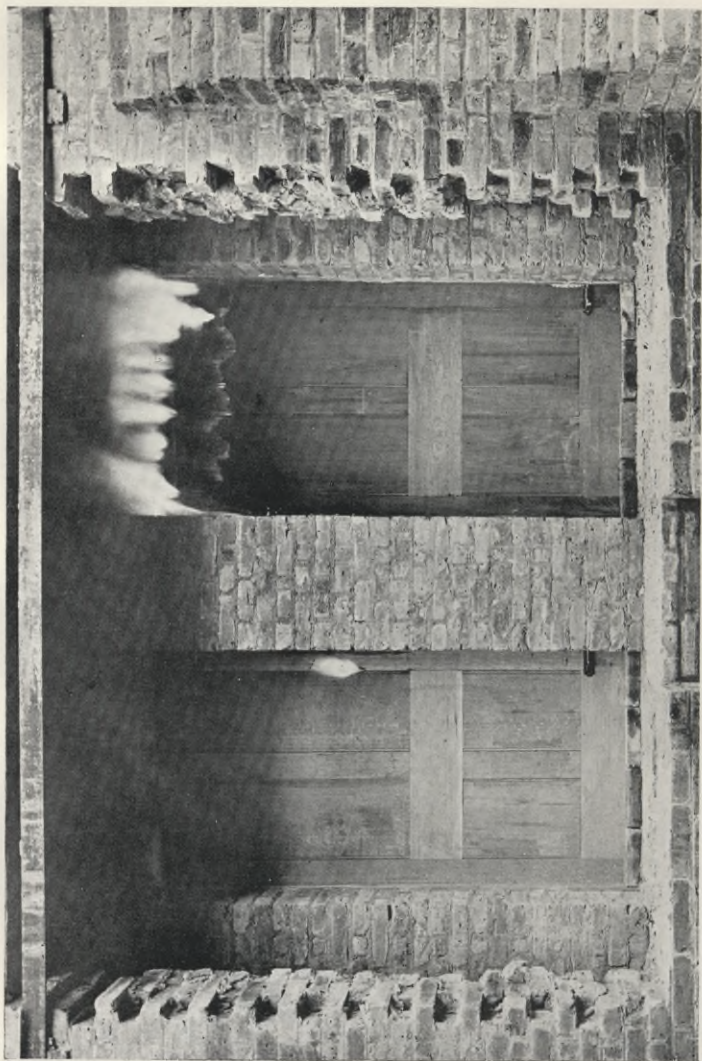


Fig. J. VIEW SHOWING CONDITION OF DOORS AFTER 39 MINUTES.

TEAK DOOR.

OAK DOOR.



Fig. K. VIEW SHOWING CONDITION OF DOORS AFTER 46 MINUTES.

TEAK DOOR.

OAK DOOR.

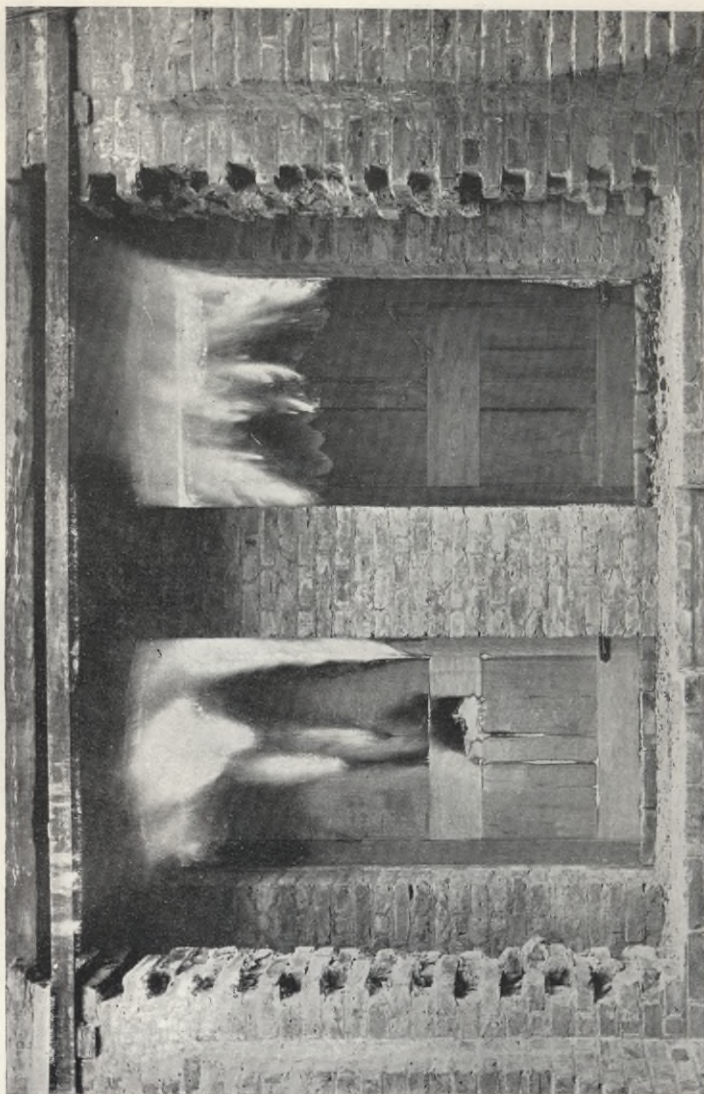


Fig. 1. VIEW SHOWING CONDITION OF DOORS AFTER 53 MINUTES.

TEAK DOOR.

OAK DOOR.

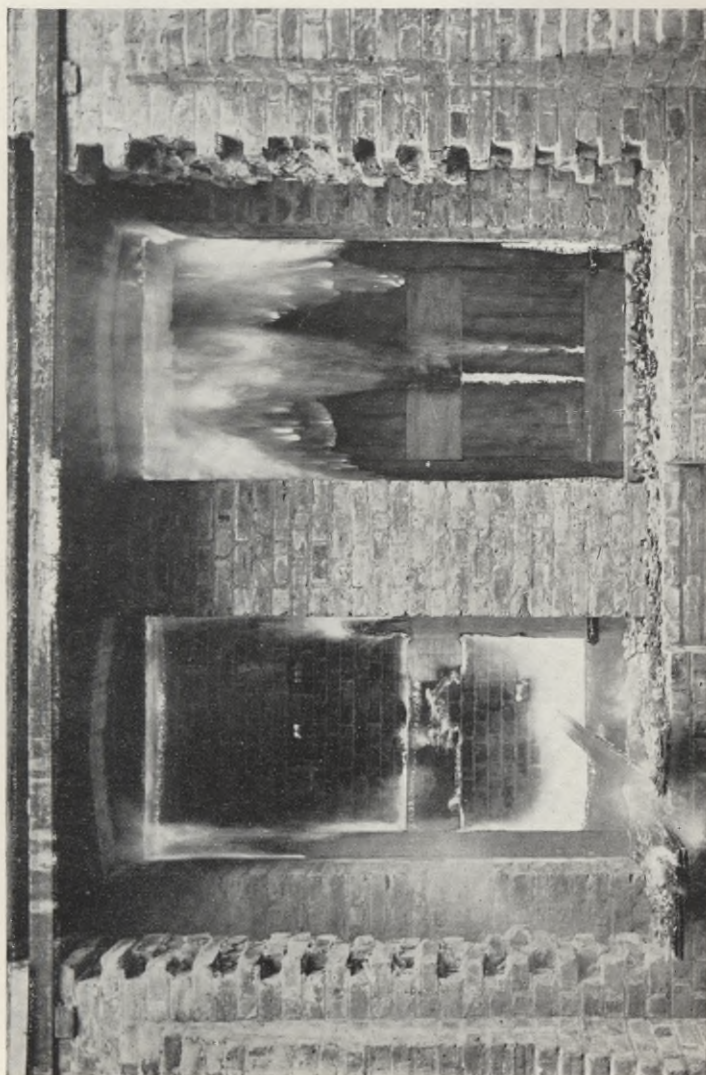


Fig. m. VIEW SHOWING CONDITION OF DOORS AFTER 55 MINUTES.

TEAK DOOR.

OAK DOOR.

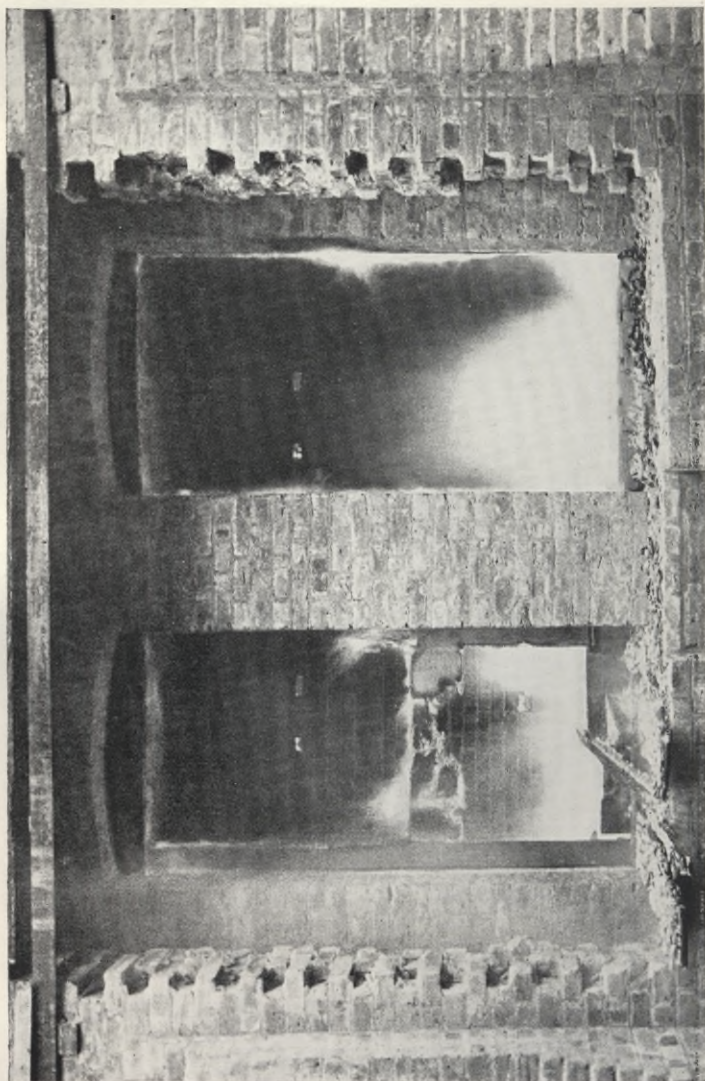


Fig. N. VIEW SHOWING CONDITION OF DOORS AFTER 58 MINUTES.

OBSERVATIONS AFTER TEST.

OAK DOOR.

On July 6th. The door frame was still in position, but charred on the inside face to a depth of $1\frac{1}{4}$ in. The remains of the upper panels of door showed a small area of uncharred surface on the side away from the fire.

TEAK DOOR.

On July 6th. The door frame was still in position, but charred on the inside face to a depth of $1\frac{1}{4}$ in. The head of door frame was more seriously damaged than the posts. There were few remains of the door, it having fallen inwards at the time of collapse.

GENERAL ARRANGEMENTS.

The test was carried out as an experimental test in accordance with the procedure laid 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. Frederic R. Farrow, F.R.I.B.A.

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), superintended the instrument room.

The Executive was represented by:—

Mr. Edwin O. Sachs (Chairman).

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

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

The general body of Members were represented by:—

Mr. W. H. Atkin Berry, F.R.I.B.A.

Mr. George Elkington, F.R.I.B.A. (District Surveyor, Penge).

Mr. Chester Foulsham (District Surveyor, Bromley).

Mr. Thomas Leach (Chief Officer, Wimbledon Fire Brigade).

Mr. G. McDonnell, F.R.I.B.A. (District Surveyor, Islington).

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

Mr. J. C. Stransom (Theatres and Music Halls Branch, London County Council).

Mr. Edgar Worthington (Secretary Inst. M.E.).

Signed,

For the Sub-Committee conducting the Test:

ELLIS MARSLAND.

For the Commercial Section:

FREDERIC R. FARROW.

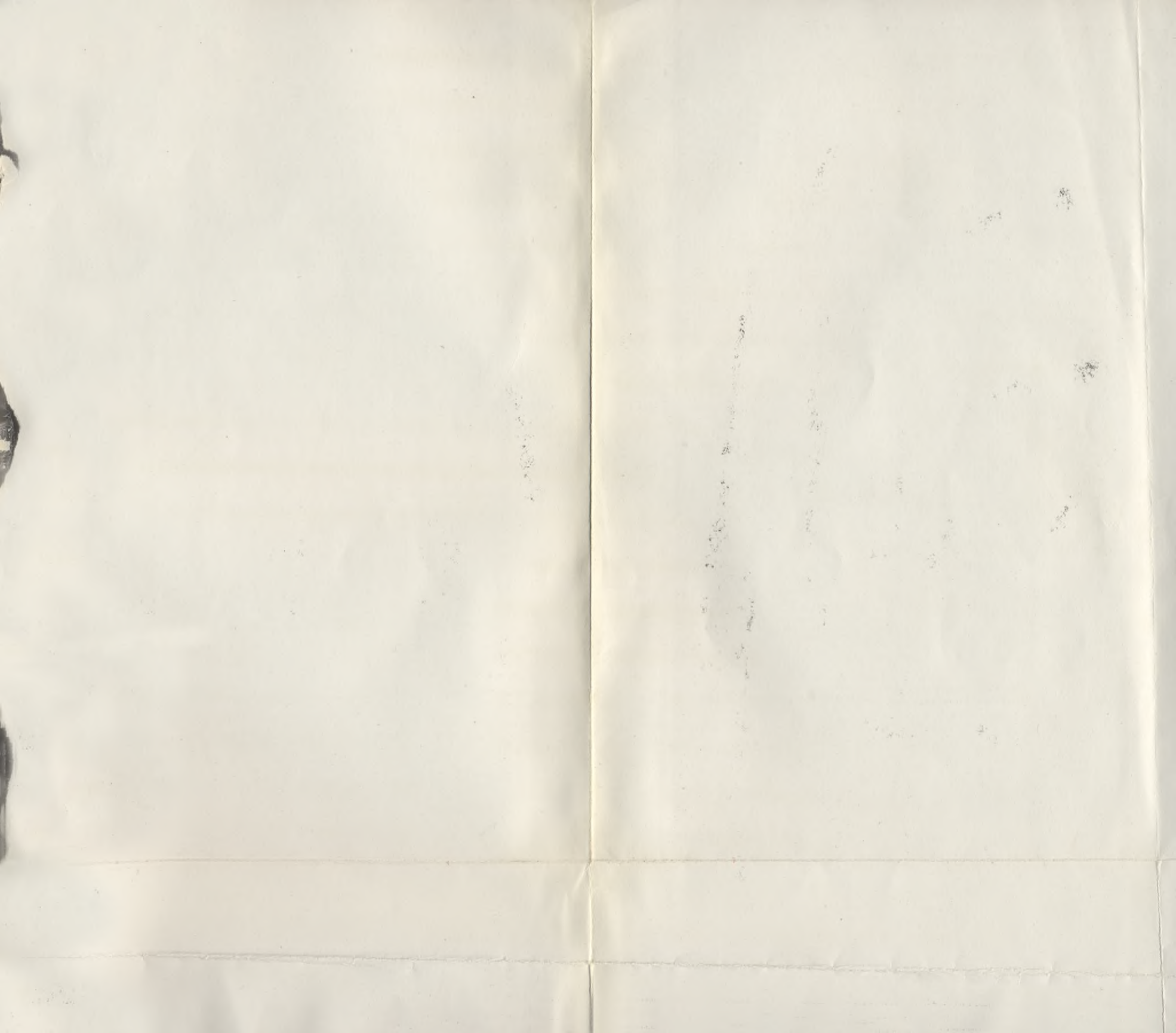
For the Executive:

EDWIN O. SACHS.

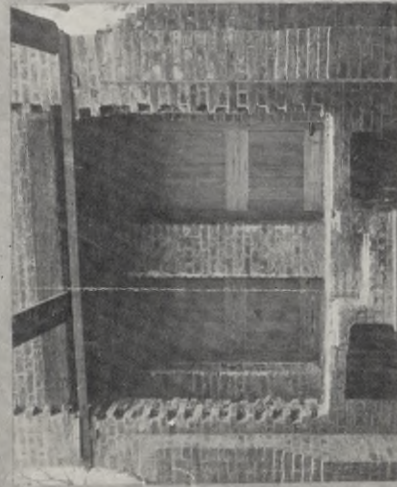
Published by the Committee
as directed by the Executive.

GEORGE E. MONCKTON
(Secretary).

Date—September 22nd, 1899.

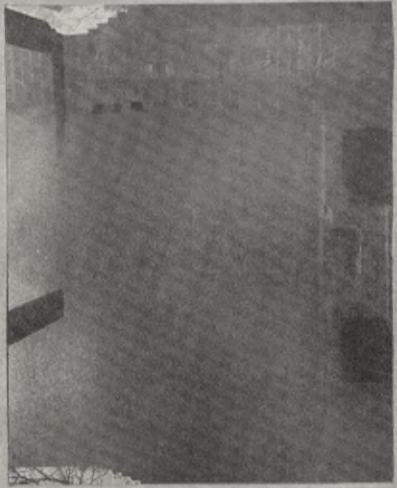


PITCH PINE DEAL



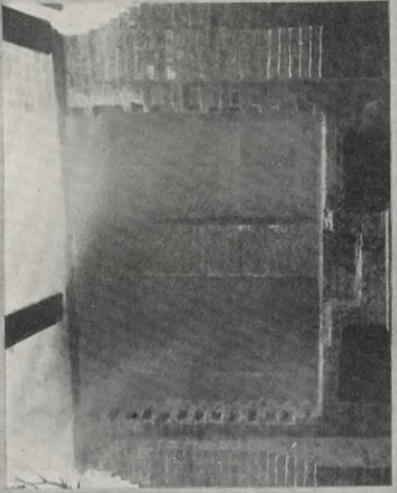
№1. TIME 3.20^{pm} TEMP. 300°

PITCH PINE DEAL

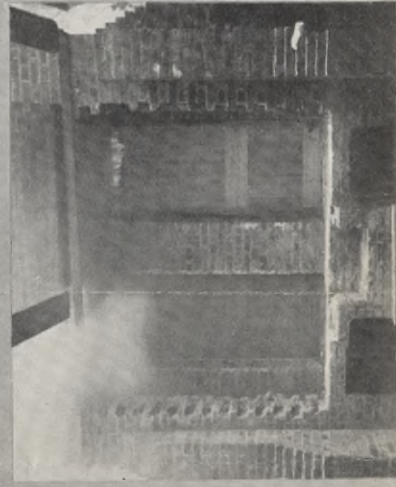


№2. TIME 3.25^{pm} TEMP. 850°

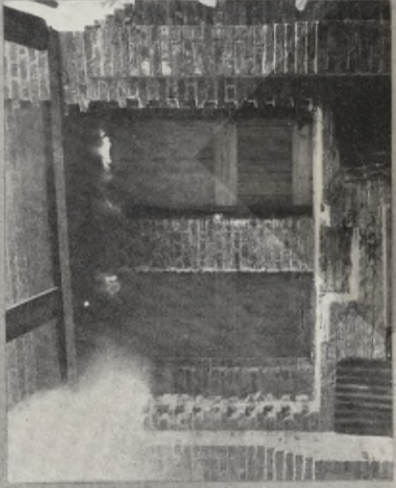
PITCH PINE DEAL



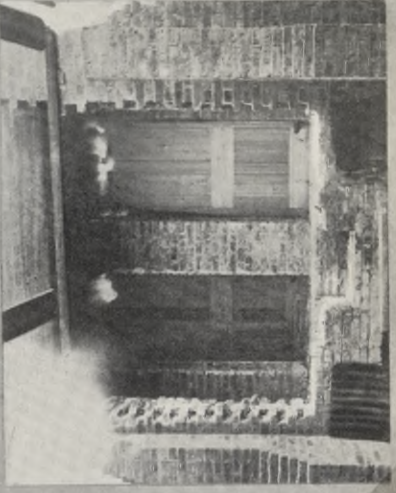
№3. TIME 3.30^{pm} TEMP. 1300°



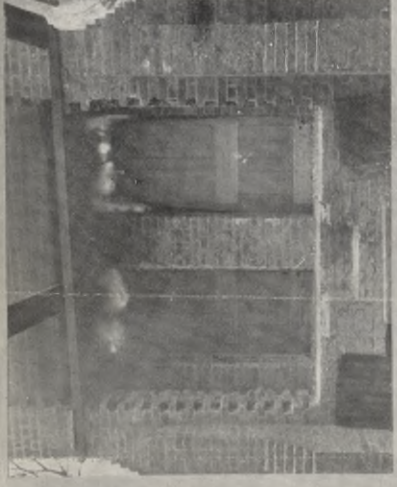
№4. TIME 3.32^{pm} TEMP. 1450°



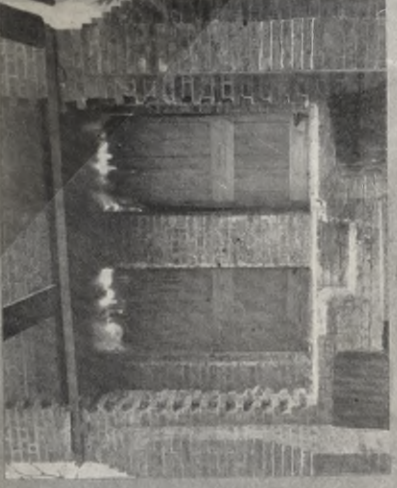
№5. TIME 3.35^{pm} TEMP. 1990°



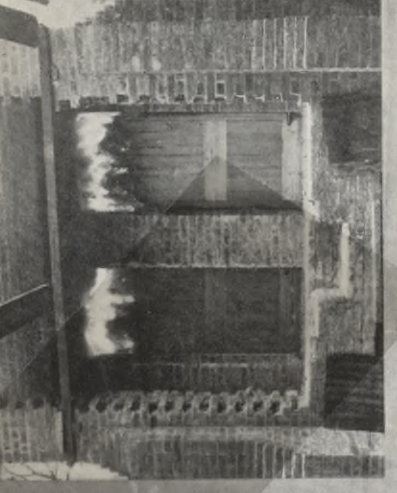
№6. TIME 3.40^{pm} TEMP. 1500°



№7. TIME 3.45^{pm} TEMP. 1550°



№8. TIME 3.50^{pm} TEMP. 1500°



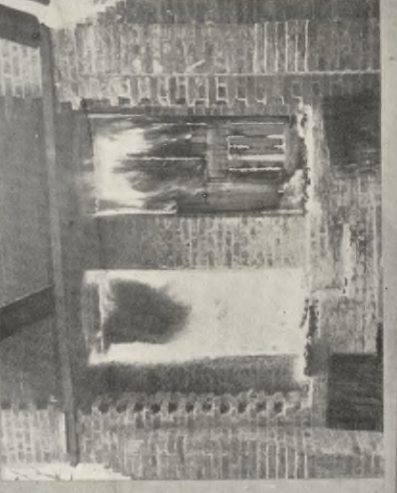
№9. TIME 3.55^{pm} TEMP. 1500°



№10 TIME 4.0^{pm} TEMP. 1620°



№11. TIME 4.5^{pm} TEMP. 1650°



№12 TIME 4.10^{pm} TEMP 1450°