

# FIRE TESTS WITH DOORS.

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- (Da) A  $2\frac{3}{8}$ -in. DOOR OF ARCHANGEL DEAL, CONSTRUCTED IN THREE THICKNESSES.
- (Ea) A  $1\frac{5}{8}$ -in. DOOR OF TEAK, FLUSH PANELLED ON EACH SIDE, THE PANELS BEING IN TWO 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  
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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.

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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 report presented in this publication again shows the results obtained in two door tests. The teak door used in this case had been condemned by a district surveyor as not complying with the Building Act, the panels being constructed in two thicknesses and the total thickness being insufficient.

The deal door was one that was specially constructed for the purposes of this test and was in three thicknesses, the thicknesses being held together by deal pins.

This publication should be read together with the reports on other door tests, particularly in this case with the door tests with three thickness doors held together with clasp nails (Publication No. 49).

EDWIN O. SACHS.

*October 1st, 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. 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.*

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

[FOUNDED 1897.—INCORPORATED 1899.]

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FIRE TEST Da, Ea.—MARCH 28TH, 1900.

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- (Da) A  $2\frac{3}{8}$ -in. Door of Archangel Deal, constructed in three thicknesses.
- (Ea) A  $1\frac{5}{8}$ -in. Door of Teak, flush panelled on each side, the panels being in two 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. by 7 ft.

SUMMARY OF EFFECT.

DEAL DOOR.

In 53 minutes flame appeared on the outside through the vertical joint between boards in centre of door just above the sill.

In 66 minutes a hole about 6 inches square was burnt through door in centre just above sill, and also a small hole level with top bolt in second joint from east side, there was no other sign of damage on the outside.

At the conclusion of the test the door remained in position.

After conclusion of the test it was seen that the two inner thicknesses were practically gone.

#### TEAK DOOR.

In 16 minutes flame appeared over the top of door.

In 53 minutes the whole of the top rail of door was burning, and flame also appeared between joints of lower panels and muntin.

In 58 minutes the west portion of top rail fell.

In 65 minutes the greater part of the door fell, leaving the east style, a portion of the west style and the bottom rail in position, but much burnt.

*Note.*—The duration of the test was 71 minutes, or 11 minutes beyond the hour defined in the "Object of Test."

#### DESCRIPTION OF THE TESTING PLANT.

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

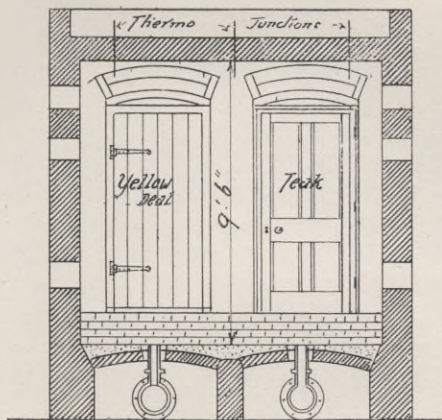
The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 6 Hut.

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

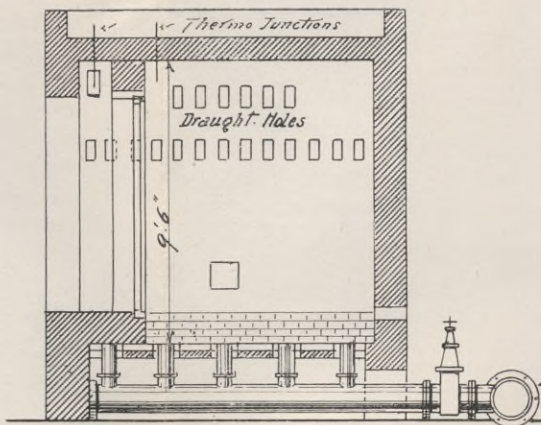
The ceiling of the hut was 9 ft. 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire-clay. The chamber in which the fire was measured 10 ft. by 7 ft. 10 in.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

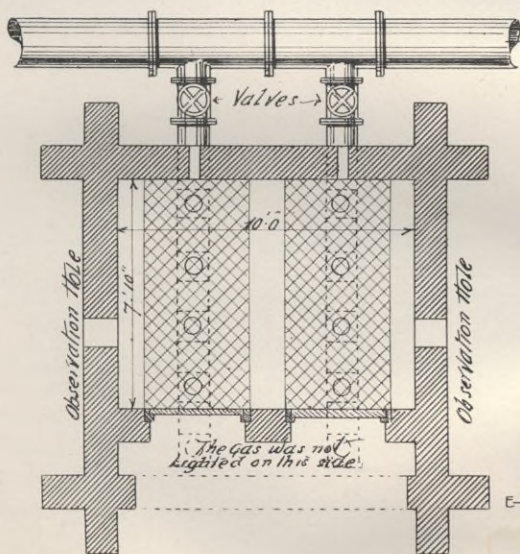




SECTION LOOKING NORTH



SECTION LOOKING EAST

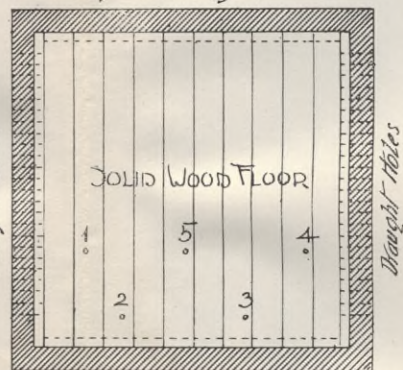


1027

PLAN OF HUT

To Gas Producer

Note. Points marked 1 2 3 4 5  
are Thermo Junctions attached to wires  
leading to Pyrometers. That marked  
5 is self recording

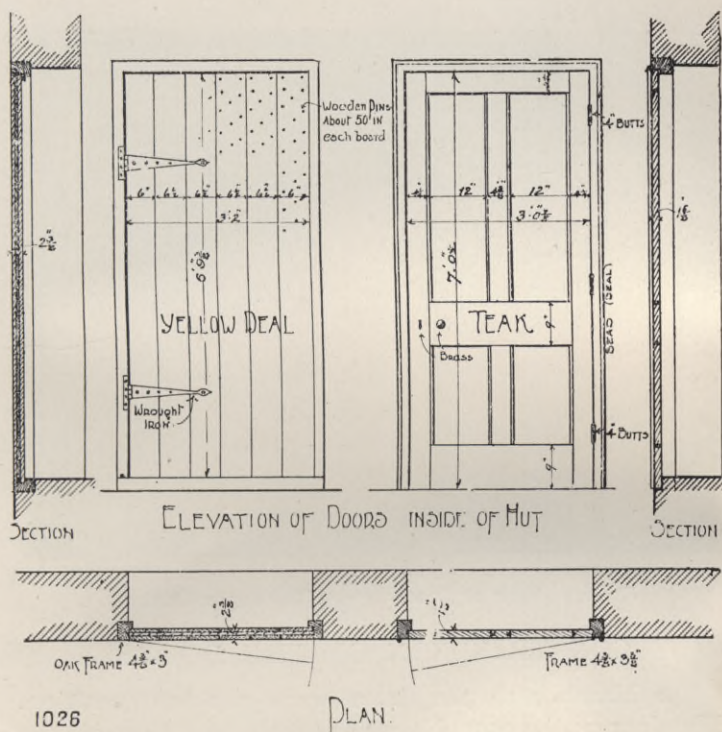


PLAN OF ROOF



The 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 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.



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PLAN.

DETAILS OF DOORS. Figs. E and F.

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.

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

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 the floor and the 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.

TEAK.

DEAL.



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

### CONSTRUCTION OF THE DOORS.

On March 26th the doors were put into position. The door on the east side was of teak, and that on the west side of clean yellow deal from Archangel.

#### DEAL DOOR.

The deal door was 3 ft. 2 in. wide by 6 ft.  $9\frac{3}{8}$  in high,  $2\frac{3}{8}$  in. thick, constructed of three thicknesses of boards, the middle thickness being horizontal, and the outer

ones vertical. The boards were butt jointed; they were secured together with  $\frac{3}{8}$  in. deal double wedge-shaped pins, driven in from both sides, about fifty to each board. The top and sides of door were splayed to fit the splayed rebate on frame.

The door was hung on two wrought iron cross garnet hinges, the door was fastened with four 6-in. iron neck barrel bolts to a frame of oak,  $4\frac{3}{8}$  in. by 3 in., with a splayed rebate, the screws to secure the bolts being  $1\frac{1}{4}$  in. long and only driven into the outer thickness. The frame was secured to the brickwork by spikes driven into deal plugs inserted in the joints of the brickwork.

#### TEAK DOOR.

The teak door was 3 ft.  $0\frac{7}{8}$  in. wide by 7 ft.  $0\frac{1}{2}$  in. high,  $1\frac{5}{8}$  in. thick, four panel, bead butt both sides, the panels being flush each side, the panels being in two thicknesses.

The styles and top rail were  $4\frac{1}{4}$  in. wide; the centre and bottom rails were 9 in. wide. The panels were tongued into the styles and rails. The door was hung with three 4-in. wrought iron butt hinges and secured with a 5-in. mortice lock and brass furniture, to a teak frame  $4\frac{3}{8}$  in. by  $3\frac{3}{8}$  in., with a  $\frac{1}{2}$  in. rebate. The frame was secured to the brickwork by spikes driven into deal plugs inserted in the joints of the brickwork.

The frames were pointed all round with mortar.

#### THE TEST.

(See Figs. I to 12, E to L).

On March 28th, 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, overcast; Rain, none; Wind, N.N.E.;  
 Barometer, 29.54 in.; Attached Thermometer,  $43^{\circ}$  Fahr.;  
 Dry Bulb,  $39.2^{\circ}$  Fahr.; Wet Bulb,  $36.8^{\circ}$  Fahr.; Remarks,  
 dull afternoon, cold, hazy.

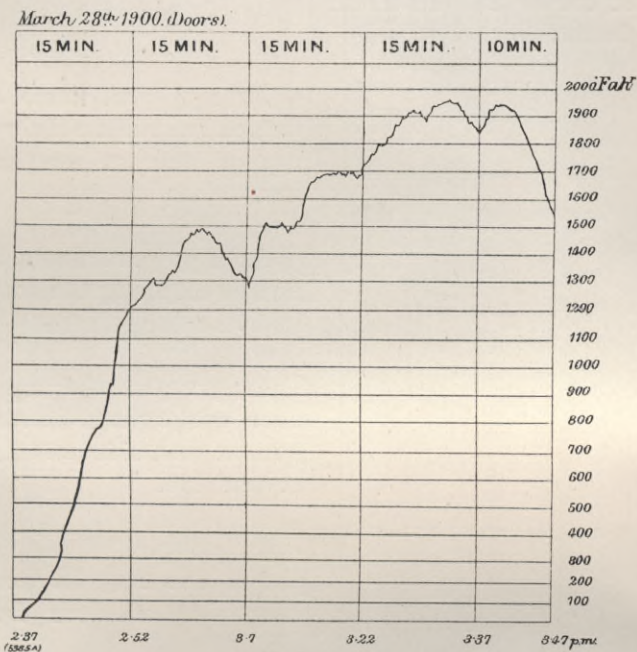
The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4, and the diagram on next page shows the continuous record from point No. 5.

## OBSERVATIONS TAKEN AT POINTS NOS. 1, 2, 3 &amp; 4.

*From 2.39 p.m. to 3.48 p.m.*

TIME.	INSIDE.		OUTSIDE.	
	No. 1. Fahr.	No. 4. Fahr.	No. 2. Fahr.	No. 3. Fahr.
2.39 p.m.	300°	110°	—	—
2.42 „	100°	150°	—	—
2.45 „	500°	875°	—	—
2.48 „	1,100°	1,200°	—	—
2.51 „	1,200°	1,300°	—	—
2.54 „	1,200°	1,300°	—	—
2.57 „	1,350°	1,410°	—	—
3.0 „	1,350°	1,440°	103°	—
3.3 „	1,240°	1,340°	105°	—
3.6 „	1,302°	1,460°	103°	—
3.9 „	1,390°	1,490°	150°	—
3.12 „	1,460°	1,610°	200°	—
3.15 „	1,580°	1,675°	275°	—
3.18 „	1,550°	1,630°	345°	—
3.21 „	1,625°	1,740°	380°	—
3.24 „	1,700°	1,820°	550°	—
3.27 „	1,780°	1,860°	730°	—
3.30 „	1,850°	1,900°	890°	—
3.33 „	1,800°	1,850°	1,080°	—
3.36 „	1,750°	1,800°	1,060°	—
3.39 „	1,800°	1,860°	1,410°	—
3.42 „	1,700°	1,750°	1,300°	—
3.45 „	1,490°	1,550°	1,160°	105°
3.48 „	1,400°	1,450°	1,050°	100°

## AUTOMATIC RECORD AT POINT NO. 5.



DEAL DOOR.

TEAK DOOR.

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

At 2.37 p.m. the gas was lighted. (See Fig. G.)

At 2.37 p.m. the gas was lighted. (See Fig. G.)

At 2.39 p.m. smoke came through the joint between top of door and frame.

DEAL DOOR—*continued.*

At 2.44 p.m. smoke came through the joint between top of door and frame at west corner and for about 12 inches down west side.

TEAK DOOR—*continued.*

At 2.53 p.m. flame appeared intermittingly over top of door at west corner.

At 2.55 p.m. flame appeared all along the top of door.

At 3.0 p.m. the top of door was twisted inwards  $\frac{3}{4}$  in. at west side and  $\frac{1}{4}$  in. at east side.

At 3.0 p.m. flame appeared about 15 in. down west side of door from top.

At 3.24 p.m. flame appeared through keyhole, and through the wood around lock, the flame over door increasing, top rail being much burnt.

At 3.26 p.m. door bulging outwards in centre, about middle of upper panels.



DEAL DOOR—*continued.*

At 3.30 p.m. first appearance of flame through the joint between boards in centre of door above sill, about 2 in. long.

At 3.35 p.m. flame appeared through centre board at bottom where one of the pins had been burnt through. (See Fig. I.)

At 3.42 p.m. a hole about 6 in. square was burnt through the door in centre above sill, and also a small hole level with top bolt in second joint from east side, but there was no other sign of damage on the outside. (See Fig. L.)

At 3.48 p.m. the gas was shut off.

At 3.49 p.m. water was applied to the outer face of door for two minutes.

TEAK DOOR—*continued.*

At 3.30 p.m. the whole of the top rail of door was burning and flame beginning to extend down style and panel on the west side. Flame also appeared between east lower panel and muntin at bottom.

At 3.35 p.m. flame appeared between joints on both sides of west lower panel and on west side of east lower panel; whole height of panel, west portion of top rail fallen in. (See Fig. I.)

At 3.42 p.m. the greater part of the door fell, leaving the east style, a portion of the west style and the bottom rail in position, but much burnt. (See Fig. L.)

At 3.48 p.m. the gas was shut off.

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

At 2.44 p.m. the face of the door commenced to blaze all over.

At 2.44 p.m. the face of door commenced to blaze all over.

At 3.30 p.m. the whole of the inner thickness of the door had fallen except some small portions, and the lower hinge was quite clear of door.

DEAL.

TEAK.

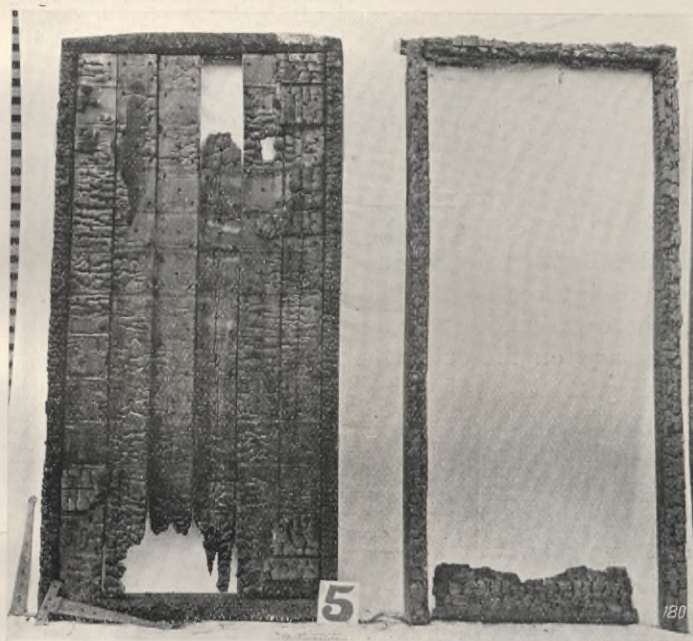


Fig. M VIEW OF DOORS SHOWING CONDITION OF INSIDE AFTER REMOVAL.

## OBSERVATIONS AFTER TEST.

## DEAL DOOR.

The whole of the inner thickness was gone, also almost all the middle thickness, except some fragments down each side. (See Figs. M and N.)

## TEAK DOOR.

The styles which remained up when remainder of door fell were badly burnt and fell shortly after. The lower rail was also much burnt. (See Figs. M and N.)

On the 29th March the doors were removed and photographs shown in Figs. M and N were taken.

TEAK.

DEAL



Fig. N. VIEW OF DOORS SHOWING CONDITION OF OUTSIDE AFTER REMOVAL.

## GENERAL ARRANGEMENTS.

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

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

Mr. Ellis Marsland, District Surveyor, Camberwell.

Mr. Matt Garbutt, A.M.Inst.C.E.

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 Council was represented by :—

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

The Executive was represented by :—

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Mr. Chas. E. Goad, M.Am.Soc.C.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 :—

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Mr. Arthur Crow, F.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., District Surveyor, St. Margaret's.

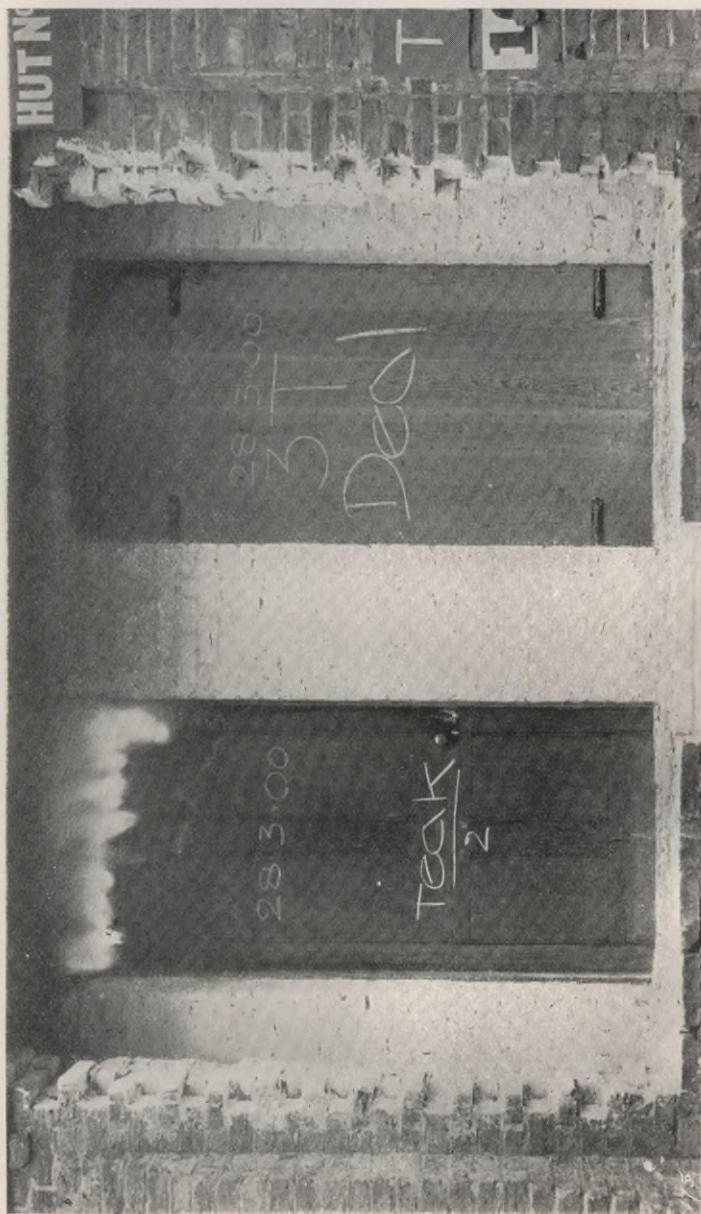


Fig. 11. VIEW OF DOORS SHOWING CONDITION AFTER 50 MINUTES.

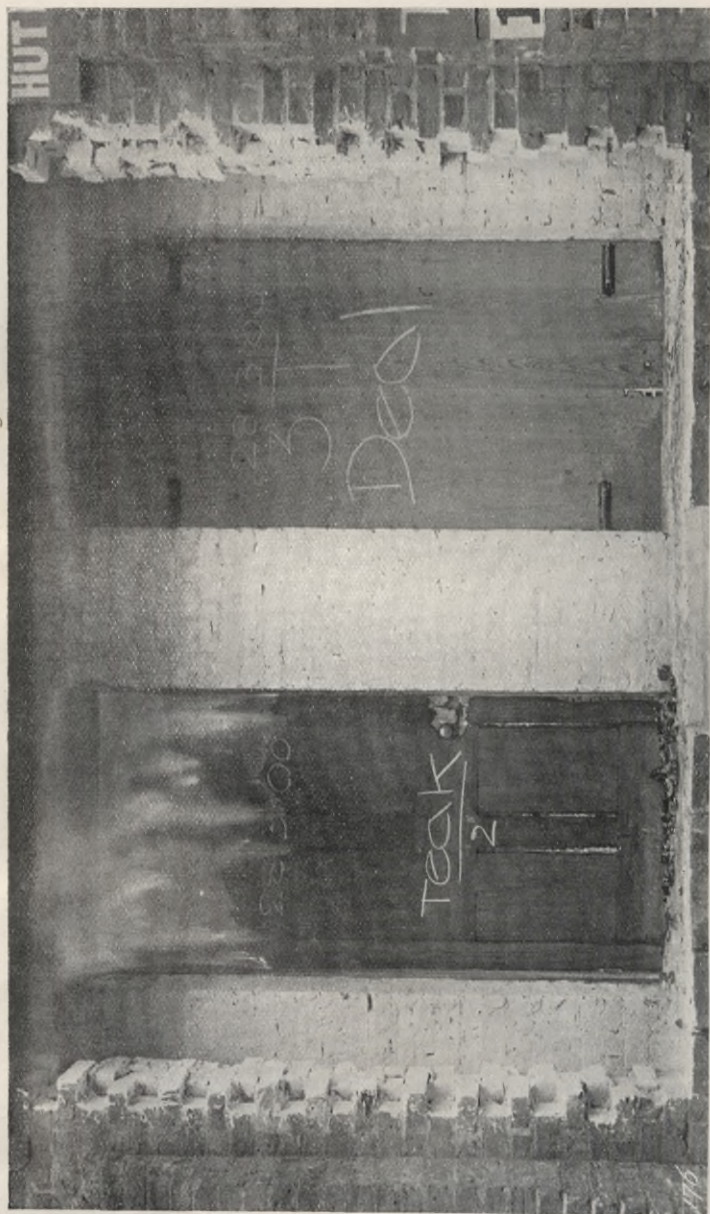


Fig. 1. VIEW OF DOORS SHOWING CONDITION AFTER 60 MINUTES.

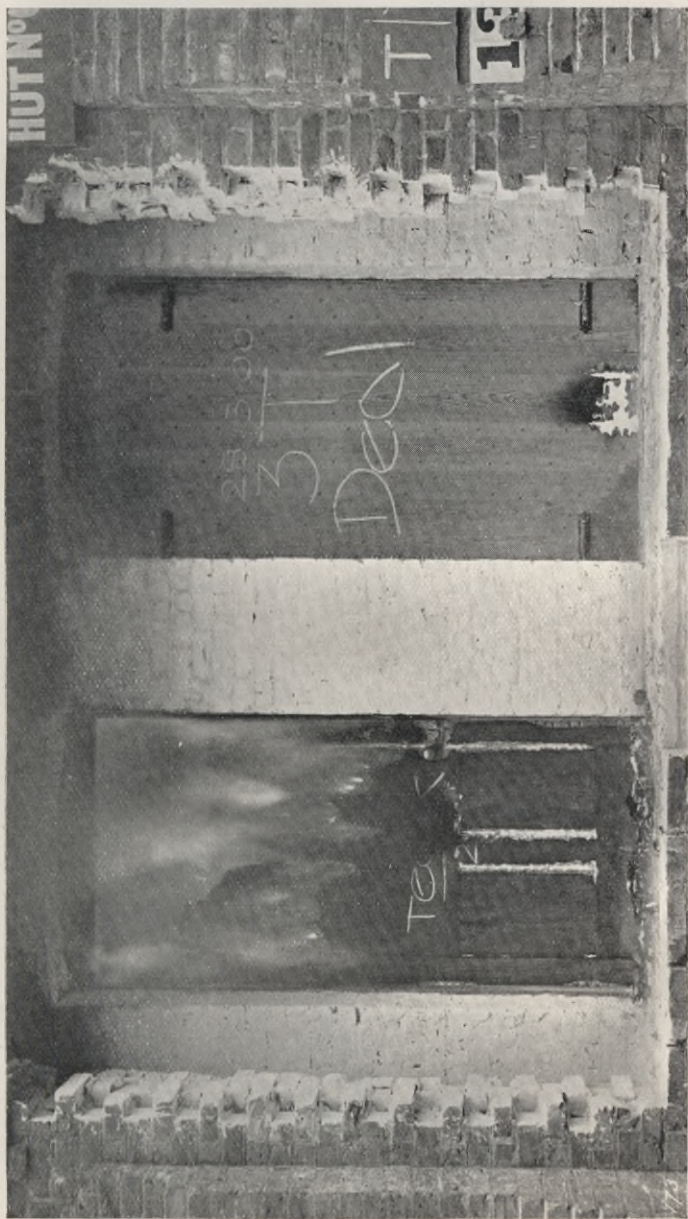


Fig. K, VIEW OF DOORS SHOWING CONDITION AFTER 63 MINUTES.



Fig. 1. VIEW OF DOORS SHOWING CONDITION AFTER 65 MINUTES.



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Brigade Union.
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- Mr. A. Fearnhead.
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- Mr. R. F. P. Notley, F.R.I.B.A., F.S.I., District  
Surveyor, Bethnal Green.
- Mr. W. Weaver, M.Inst.C.E., Surveyor to the  
Vestry of St. Mary Abbots, Kensington.

The Commercial Section was represented by:—

- Mr. F. R. Farrow, F.R.I.B.A. (Chairman).
- Lieut.-Col. J. Colquhoun.
- Mr. Gilbert Davenport (The Expanded Metal Co.).
- Mr. J. A. King (Messrs. J. A. King & Co.).
- Mr. J. D. O'Brien (The Columbian Fireproofing Co.).
- Mr. H. Salmon (The Expanded Metal Co.).
- Mr. H. Brome Tarry (The British Uralite Co.).
- Mr. J. F. Golding (The Expanded Metal Co.).
- Mr. D. R. Radcliff (The Ratner Safe Co.).
- Mr. Alfred Williams (Messrs. G. A. Williams & Son).

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

- Mr. A. Howard Colls.
- Mr. T. Costigan (Sec. Builders' Institute).
- Mr. Coward.

Mr. Howard Dru Drury.  
 Mr. R. J. Friswell.  
 Mr. T. E. Gatehouse, F.R.S.Ed.  
 Mr. A. E. Buthrey.  
 Mr. H. E. Hamsley.  
 Mr. E. R. Marsland.  
 Mr. W. G. Perkins.  
 Mr. Harry Rogers.  
 Mr. E. S. Young.

Signed,

*For the Sub-Committee conducting the Test:*  
 MAX CLARKE (*Directing Member*).

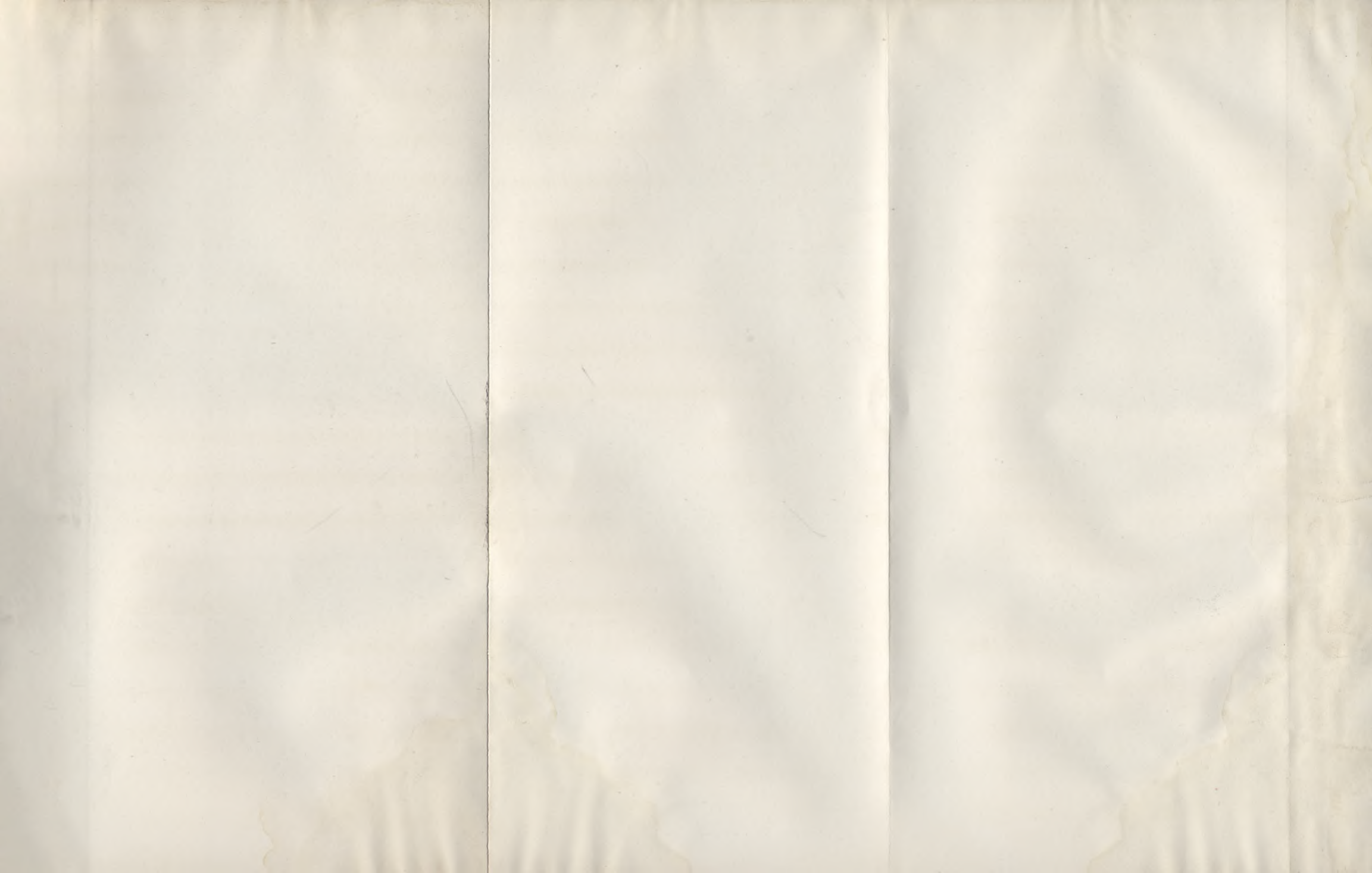
*For the Commercial Section:*  
 FREDERIC R. FARROW.

*For the Executive:*  
 EDWIN O. SACHS (*Chairman*).

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

H. S. TAYLOR  
 (*Asst. Secretary*).

*Date—October 1st, 1900.*



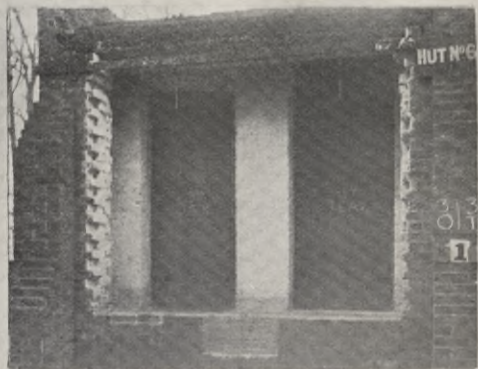


FIG. 1. TEMP 900° TIME 4.6 pm.



FIG. 2. TEMP 1125° TIME 4.17 pm.

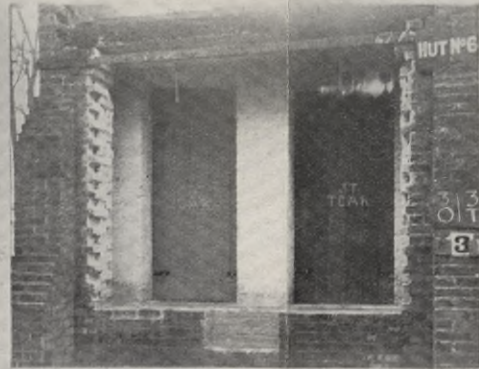


FIG. 3. TEMP 1315° TIME 4.22 pm.

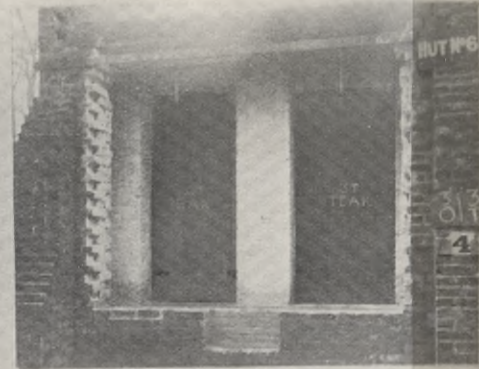


FIG. 4. TEMP 1400° TIME 4.27 pm.

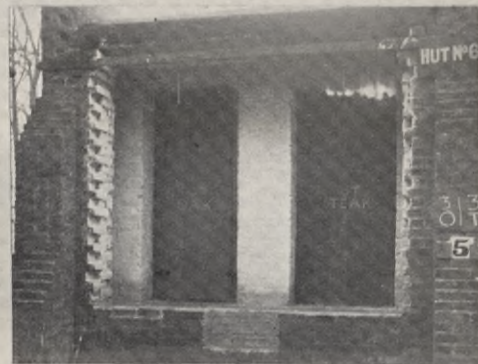


FIG. 5. TEMP 1600° TIME 4.37 pm.



FIG. 6. TEMP 1750° TIME 4.47 pm.



FIG. 7. TEMP 1810° TIME 4.52 pm.



FIG. 8. TEMP 1900° TIME 4.57 pm.



FIG. 9. TEMP 1900° TIME 5.2 pm.

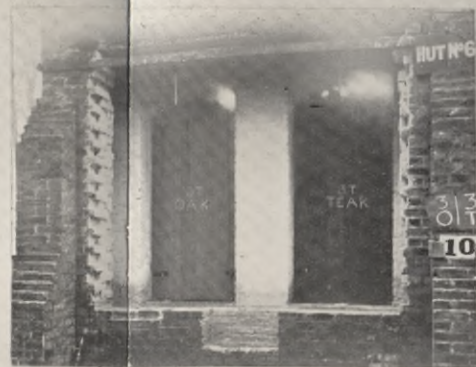


FIG. 10. TEMP 1950° TIME 5.7 pm.



FIG. 11. TEMP 1960° TIME 5.12 pm.



FIG. 12. TEMP 1970° TIME 5.17 pm.