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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
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CHIMNEY FIRES WHICH SPREAD BEYOND THE CHIMNEY

(An analysis of incidents contained in a one-in-sixteen sample of reports from Fire Brigades in Great Britain 1956.)

by

J. E. L. Hinton and M. A. Weston

Summary

An analysis has been made of about one-in-sixteen of the incidents attended by Fire Brigades during 1956 in which chimney fires spread beyond the chimney. In the majority of the incidents the fire spread was caused by a fault in design or a structural defect due to ageing. In most of the incidents the damage caused by the spread of fire was only slight, but in about 23 per cent it was more serious.

November, 1957.

Fire Research Station,
Boreham Wood,
Herts.

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INTRODUCTION

The numbers of chimney fires confined to the chimneys attended annually by Fire Brigades in Great Britain have shown a very marked increase during the last 10 years, rising from about 25,000 in 1947 to 60,000 in 1952, remaining stationary at about 66,000 in 1954 and 1955 and rising again to 72,000 in 1956. The problem of chimney fires is almost entirely confined to dwellings and although the annual attendances of Brigades at all fires in dwellings (other than chimney fires confined to the chimneys) have also risen since 1947, the increase is far less marked than in the case of chimney fires (See Table I and Fig. 1.).

Chimney fires cause great inconvenience and expense to the Fire Brigades as well as forming a persistent hazard to the householder and in 1954 at the request of the Interdepartmental Fire Prevention Committee, the Joint Fire Research Organization conducted a survey⁽¹⁾ with the object of discovering the causes of the chimney fires and the reason for their increasing frequency. Ten Fire Brigades co-operated in this survey and about 15,000 reports were examined but no single factor concerning the causes of chimney fires or the reasons for the increase emerged. However, there were indications that further research along some lines might be profitable.

The majority of chimney fires are confined to the chimney and cause no damage but each year Fire Brigades receive a number of calls to chimney fires which have caused some damage to the building and the annual incidence of these has shown a ten-fold increase since 1947 (Fig. 1). They are likely to be the most dangerous of the chimney fires, and for this reason a study has been made of reports on them.

In 1956, 770 calls to chimney fires which spread beyond the chimneys were included in a random one-in-four sample of all reports from Fire Brigades in Great Britain which was used for the preparation of statistical tables.

From the 770 reports of these fires a one-in-four sample was chosen at random; this yielded 191 reports (i.e. approximately one-in-sixteen of the total) which were examined in detail.

CAUSES OF SPREAD OF FIRE BEYOND THE CHIMNEY

The causes of the spread of fire beyond the chimney are shown in Table II. In about 50 per cent of the incidents fire was caused by burning soot or sparks escaping from the chimney breast or hearth. A further 13 per cent were caused by beams set into the chimney becoming ignited by sparks or burning soot, and about 18 per cent by conducted heat from a chimney fire cracking walls or igniting nearby woodwork.

DAMAGE

In about 65 per cent of the incidents, the damage caused was slight but involved structure or both structure and contents; in a further 13 per cent, the damage was slight and involved contents only, but in 23 per cent of the incidents more serious damage was reported.

DISCUSSION

Of the chimney fires spreading beyond the chimney, reports of which were examined, about half were caused by sparks or burning soot escaping from the chimney breast or flue through a defect, or by soot which had collected previously in cavities becoming ignited by sparks escaping from the chimney breast. The material first ignited in such cases was generally structural woodwork near the chimney.

A further 13 per cent of the incidents were due to timber set into the chimney breast becoming ignited either directly by flames from the fire or from soot becoming ignited upon it. An explanation of these fires might be that beams have been inserted into chimney breasts in such a way that a small cavity has been left between the wall of the flue and the end of the beam. Even if this cavity were filled with mortar and pargetted over, the mortar would eventually crumble and fall out leaving a cavity in which soot could collect undisturbed by sweeping. The soot might then become ignited thus setting fire to the beam.

It seems, therefore, that the majority of the chimney fires which spread beyond the chimney do so as a result either of bad design or construction, or of defects which appear due to age, e.g. cracks in brickwork. Almost all the incidents occurred in buildings of prewar construction.

The chances of fire spreading beyond a chimney that is well designed and structurally sound are fairly small, a sudden shower of burning soot from the chimney presenting the greatest danger. Very few spreads were reported to have been caused by heat from a chimney fire conducted through the chimney breast.

The time intervals between the discovery of the fire and the call to the Fire Brigade have been examined and it was found that in only 11 incidents (about 5 per cent of the total) was it likely that the spread of fire was caused by neglect to call the brigade earlier. In the majority of the cases the interval between the discovery of the fire and the call to the Brigade was said to be less than 6 minutes.

CONCLUSIONS

It is apparent from this examination that the majority of chimney fires that spread beyond the chimney do so through some structural defect due either to faulty construction in the first instance or to age. These defects are such that their presence is not suspected until the fire occurs and an inspection is made. Short of an exhaustive periodic inspection of chimneys, which would be both difficult and expensive, there appears to be little possibility of completely preventing chimney fires from spreading beyond the chimney of origin. Effective inspection of chimney construction and fire-place installation in new buildings would appear to be highly desirable, and it is possible that the use of chimney liners might reduce the dangers of deterioration with age.

REFERENCE

- (1) MILLAR, D. W. et al. Chimney fires. Joint Fire Research Organization F.R. Note No. 265. Sept. 1956.

TABLE I

Chimney fires attended by Fire Brigades in Great Britain
1947-56 compared with all attendances at fires in dwellings

Year	No. of chimney fires confined to chimney		No. of chimney fires spread beyond chimney		Total fires in dwellings	
	No.	Index 1947 = 1	No.	Index 1947 = 1	No.	Index 1947 = 1
1947	24952	1.00	346	1.00	16420	1.00
1948	-	-	229	0.66	16401	1.00
1949	-	-	244	0.71	18776	1.14
1950	-	-	652	1.88	20692	1.26
1951	-	-	1156	3.34	19696	1.20
1952	60041	2.41	2528	7.31	22204	1.35
1953	66502	2.67	2575	7.44	20955	1.28
1954	66975	2.64	3094	8.94	21442	1.31
1955	66934	2.68	3080	8.90	23084	1.41
1956	71778	2.88	3080	8.90	24080	1.47

TABLE II

Analysis of chimney fires spreading beyond the chimney

(Reports included in a 1 in 16 sample of occurrences attended by Fire Brigades in Great Britain 1956)

Cause of spread	No. of fires	Percentage of Total
Burning soot falling into room and igniting contents or structure	37	19.4
Burning soot falling behind or below fireplace or soot becoming ignited behind or below fireplace	47	24.6
Burning soot or sparks escaping into roof space or soot becoming ignited in roof space... ..	30	15.7
Sparks from chimney fire igniting wall or floor joists	4	2.1
Timber set into chimney ignited... ..	24	12.6
Conducted heat igniting fire surround, mantelpiece, etc.	5	2.6
Conducted heat igniting wall, floor or ceiling joists	10	5.2
Conducted heat igniting timber, ceiling joists or rafters in roof space	3	1.6
Conducted heat cracking walls (no further damage)	12	6.3
Conducted heat cracking chimney pot (no further damage)	2	1.1
Chimney pot and roofing only damaged... ..	1	0.5
Sparks or burning soot from chimney fire escaping via the pot (outside building)	6	3.1
Burning soot escaping through chimney and igniting walls, floors or ceilings... ..	10	5.2
Total	191	100.0

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NUMBER OF FIRES EXPRESSED AS AN INDEX (1947=1.0)

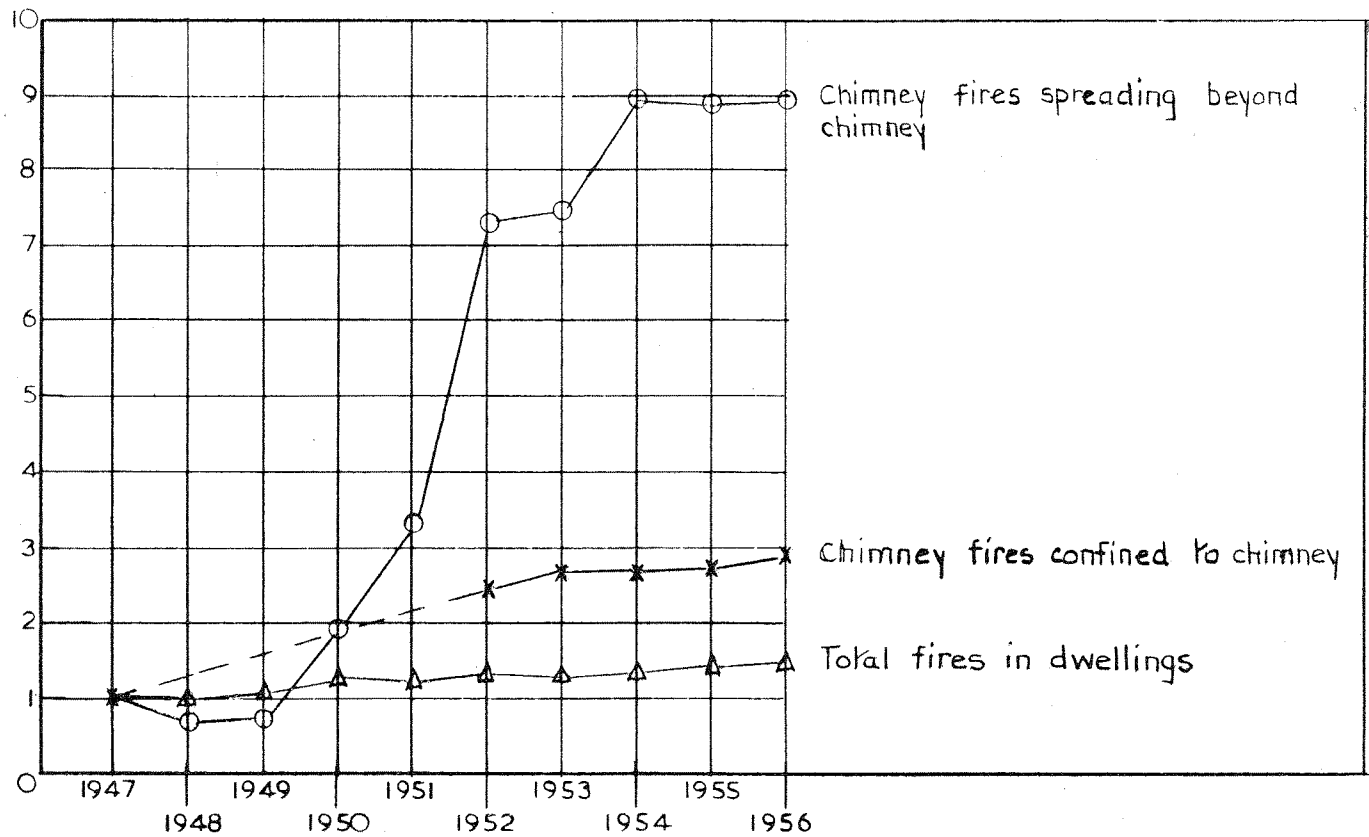


FIG.1. THE INCREASE IN CHIMNEY FIRES SPREADING BEYOND THE CHIMNEY
(RESULTS OF ANALYSIS OF REPORTS FROM FIRE BRIGADES IN GREAT BRITAIN 1947-1956)