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DEPARTMENT OF SCIENTIFIC & INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANIZATION

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FIRES IN RETAIL STORES 1960 - 1961

by

H. Woolfe and C. M. Pitt.

An analysis has been made of the reports of 118 fires which occurred in certain stores during 1960 and 1961. Most of the fires reported were small and were dealt with by the store personnel; in many cases the Fire Brigade was called only as a precautionary measure. Among the results shown by this survey perhaps the most notable was that most of the fires did not originate in either the sales or stock rooms, but in staff rooms.

September, 1962

Fire Research Station,
Boreham Wood,
Herts.

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Introduction

With a view to obtaining information on the fire hazards of department and chain stores, and on the methods of fire prevention likely to prove most effective, a special questionnaire (See Appendix 1) was designed and sent to a number of stores, who had agreed to co-operate. A list of these firms is given in Appendix 2. The questionnaires relate to any fire, however small, that occurred in these premises, whether or not the fire brigade was summoned. The present interim note analyses the results of this survey for the years 1960 and 1961.

Causes of fires

The number of fires due to each cause, for 1960 and 1961 are shown in Table 1. The proportion of fires due to each cause as given by the survey, is compared with the proportion of the fires in shops and stores in the United Kingdom as a whole during 1960. This latter figure was obtained from the United Kingdom Fire Statistics, 1960, and relates only to fires to which Fire Brigades were summoned.

As can be seen from the table, the two largest causes of fires, both in the special survey and in the United Kingdom as a whole, were those attributed to electrical apparatus and smoking materials, although smoking materials resulted in a smaller proportion of the fires in the survey than in shops and stores generally. Gas apparatus caused a large proportion of the fires included in the survey, but not of those in shops and stores in the United Kingdom as a whole. This suggests that the fires started by gas apparatus were mostly small, and that therefore no fire brigade was summoned; in fact, the Brigades were called to only one third and extinguished one fifth of them, the remainder being extinguished by the stores personnel. Some lack of agreement between the percentage of fires for each cause might be expected to result from the fact that the survey was concerned with particular types of stores, and so was not a representative sample of all shops and stores. For example refrigerator fires constituted about a third of the electrical apparatus fires in shops and stores generally, but only one occurred in the stores included in the survey. An unexpected feature of the analysis is the high proportion of unknown causes; most of the fires were dealt with before they had developed to any great extent and it had been expected that, in these circumstances, there would have been little difficulty in ascertaining their causes. Apart from these discrepancies the pattern of fire causes in all shops and stores was in reasonable agreement with that for the Stores in the survey.

TABLE 1

Cause of Fire

	Fires in Survey		All fires in shops and stores in U.K. 1960	
	No	%		
Ashes and soot	3	2.5	36	1.2
Fire in open	1	0.8	-	-
Electrical apparatus and leads	23	19.5	1012	34.5
Fish or potato frying range (all fuels)	1	0.8	12	0.4
Flue	1	0.8	24	0.8
Furnace (coke or coal)	1	0.8	-	-
Gas burner, jet, ring	10	8.5	28	1.0
Gas cooker	2	1.7	48	1.6
Gas fire, heater, radiator	2	1.7	20	0.7
Gas other apparatus	1	0.8	60	2.0
Incubator, brooder	1	0.8	12	0.4
Malicious ignition	3	2.5	20	0.7
Matches, except children with	2	1.7	44	1.5
Matches, children with	1	0.8	244	8.3
Mechanical heat or sparks	1	0.8	4	0.1
Oil blowlamp	3	2.5	32	1.1
Oxy-acetylene cutting or welding apparatus	5	4.2	8	0.3
Rubbish burning	5	4.2	116	4.0
Slow combustion stove igniting other materials	1	0.8	56	1.9
Smoking materials	14	11.9	720	24.5
Other and unknown	37	31.4	440	15.0
TOTAL	118		2936	

Table 2 shows the place of origin of the fires in relation to the cause, for the years 1960 and 1961. The table shows that the largest proportion of the fires of which the location was reported occurred in staff rooms, only about 15 per cent originated in the sales rooms and a further 15 per cent in stock rooms. No fires occurred in offices or counting houses.

Among the points demonstrated is that the main cause of fires in staff rooms was gas apparatus. Five of the eight gas apparatus fires occurring in staff rooms, originated in kitchens during the preparation of food.

TABLE 2

Cause in relation to place of origin

Place of origin	Cause								TOTAL
	Ashes and soot	Electric apparatus	Gas apparatus	Malicious ignition	Oxyacetylene cutting and welding apparatus	Rubbish burning	Smoking materials	Other and unknown	
Sales room	0	4	1	0	1	0	5	5	16
Stock room	0	4	1	2	0	0	1	8	16
Display window	0	3	0	0	0	0	0	2	5
Staff rooms*	2	2	8	0	0	0	1	7	20
Stairs, passage etc	0	1	1	0	0	0	4	1	7
Boiler room	0	1	1	0	1	0	1	2	6
Yard	0	0	0	0	0	2	1	5	8
Other & unknown	1	8	3	1	3	3	1	20	40
TOTAL	3	23	15	3	5	5	14	50	118

* includes canteen, dining room, kitchen, restroom, recreation room, cloakroom, washroom.

Time of occurrence and cost of fires

Fig.1 shows the monthly incidence of fires for the two years 1960 and 1961. It can be seen that the peak frequency was in June; the lowest occurred in the winter months from October to December although this might be expected to be one of the busiest periods of the year. Fig.2 shows the hourly incidence of fires for 1960 and 1961. This shows clearly that the majority of fires (about $\frac{2}{3}$), occurred while the stores were open, between 9 a.m. and 5 p.m. Less than 7 per cent were discovered between 11 p.m. and 7 a.m.

The numbers and costs of fires, in relation to their times of discovery are shown in Fig.3. The ratio of the numbers of fires costing more than £20 during the period 11 p.m. to 7 a.m. to the total fires during this period, is only slightly greater than the corresponding ratio for the period 9 a.m. to 5 p.m.

Thus there is no evidence from the results so far obtained that fires at night in this type of occupancy cause more damage than those during the day, although it has to be noted that none of the fires reported was in a very high cost category.

TABLE 3

Cost of fires

Cost	No of fires
less than £20	73
£20 and less than £100	16
£100 and less than £1000	8
over £1000	2
not stated	19
TOTAL	118

Table 3 shows the cost of fires for 1960 and 1961. Among the nineteen fires for which the cost was not stated, there may possibly have been some expensive fires, for which the loss had not been assessed when they were reported. Sixty-two per cent of the fires cost less than £20. This, together with the fact that some 80 per cent of the fires were extinguished without the assistance of the fire brigade, would seem to show that, although improvement in fire precautions may be possible, department stores are adequately equipped to deal with most of the fires which occur.

Discovery of fires at night

Fig.4. shows (a) the person discovering and (b) the means of discovery of fires which occurred at night, between 6 p.m. and 8.a.m.

The small number of fires discovered by automatic alarms is partly due to the small number of alarms installed in the stores considered; in only some 12 per cent of the stores where fires occurred were alarms installed. It may also be due to the visual discovery of fires before they produced sufficient heat to actuate the alarms. In neither of the cases in which the fire was discovered by an automatic alarm, did the fire spread beyond the room of origin. Eight (i.e. 25 per cent) of the fires at night were discovered by sales or office staff, seven of these eight, however, were between 6 p.m. and 9.p.m. when staff may have been working overtime.

At night, one quarter of the fires were discovered either by police or by passers by, whereas during the day, only one fire in twenty-two was so discovered.

Sprinklers

TABLE 4
Sprinklers

Action of sprinklers	1960 + 1961
Extinguished fire	3
Controlled fire	1
Operated but did not control fire	1
Total operated	5
Did not operate	22
Total installed	27
Not installed	81
Unknown	10
TOTAL	118

There were five fires in buildings which extended beyond the room of origin, but in none of these buildings were sprinklers installed. It is interesting to note that of the five cases in which sprinklers operated, three of the fires were confined to the room of origin; one was confined to the appliance from which heat emanated, a main electrical panel, and one was an outdoor hazard namely boilers on an excavation site, where the sprinkler system was in the course of construction. In one of the three fires confined to the room of origin, and both of the other two fires only one sprinkler head was actuated.

Extent of Fire

TABLE 5
Extent of Fire

IN BUILDINGS	1960 and 1961
confined to appliance (item from which heat emanated)	24
common service spaces	6
room of origin	60
floor of origin	1
building of origin	<u>4</u>
TOTAL IN BUILDINGS	<u>95</u>
NOT IN BUILDINGS	1960 and 1961
confined to hazard of origin	14
extended to building	2
other hazard	<u>7</u>
TOTAL NOT IN BUILDINGS	<u>23</u>

Table 5 contains an analysis of the extent of the fires in 1960 and 1961. Most of the fires, 70 per cent, were small in extent; 50 per cent were confined to the room of origin and 20 per cent to the appliance from which heat emanated. In addition 12 per cent were confined to the occupancy of origin.

The most conclusive evidence that the majority of the fires were small, is that Fire Brigade assistance was necessary to extinguish only one fifth of them.

International comparison

TABLE 6
Comparison with some Foreign Statistics

Region	year	% of total fires
United Kingdom	1955	2.73
France	1955	2.37
Copenhagen	1955-1956	2.27
New York	1955	1.20

Table 6 shows the percentage of the total number of fires which occurred in shops and stores in various geographical areas. The United Kingdom percentage is noticeably higher than the other regions considered, for the period in question. This may be partly due to the fires caused by smoking materials. The New York figure is particularly low. Again this may be due in some measure to the fact that smoking is prohibited in shops and stores employing more than twenty-five people. In the United Kingdom, 13 per cent of the fires in stores in 1955 were caused by smoking materials.

If the number of these fires due to smoking were subtracted from the total numbers of fires in shops and stores in the United Kingdom, the percentage of all fires in the United Kingdom would be reduced to 2.37, a figure more comparable with the proportions in France and Copenhagen.

Summary and Conclusion

It was found that out of the total of 118 fires which occurred during 1960 and 1961, no less than 20 (17 per cent) originated in staff rooms. With the exception of fires of which the place of origin was unreported (34 per cent of the total), this represents the largest group of fires in the survey. Of these 20 staff-room fires, 8 were caused by gas apparatus. There were 16 fires in sales rooms, and 16 in stock rooms. The main causes of fires were electrical apparatus (19 per cent), gas apparatus (13 per cent), and smoking materials (12 per cent).

Sixty-six per cent of the fires occurred between 9 a.m. and 5 p.m., that is during normal working hours, and only 7 per cent between 11 p.m. and 7 a.m. An analysis of the cost of these fires, showed that those occurring during the night caused only slightly greater monetary loss than those during the day.

The majority of the fires were small, both in cost and extent: 62 per cent cost less than £20, 50 per cent were confined to the room of origin and 80 per cent were extinguished without Fire Brigade assistance. Only 23 per cent of the fires were in sprinklered premises, and the sprinklers operated in less than one fifth of these cases because the fires were generally extinguished by other means before they had developed sufficiently to actuate a sprinkler head.

APPENDIX I

IN STRICT CONFIDENCE

Report No. /
For office use only

DEPARTMENT OF SCIENTIFIC & INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANIZATION

Fire Research Station,
Boreham Wood, Herts.

FIRES IN RETAIL STORES

1. Name of Firm
2. Address of store
3. (a) Date of fire (b) Time of discovery (c) Time under control
(Questions 4 - 8. Please ring round letter(s) of appropriate answer(s) and enter details where applicable)
4. Local Fire Brigade
 - a. not called
 - b. called by management
 - c. called by staff
 - d. called by customer
 - e. called by watchman/caretaker
 - f. called by other person
(specify)
5. Persons in premises at the time
 - a. public
 - b. sales &/or office staff
 - c. watchman/caretaker
 - d. workmen
 - e. others (specify)
 - f. none
6. Persons evacuated

	Number
a. public
b. sales &/or office staff
c. watchman/caretaker
d. workmen
e. other (specify)
7. Person discovering fire
 - a. customer
 - b. sales/office staff
 - c. watchman/caretaker
 - d. police
 - e. passer by
 - f. other (specify)
8. Means of discovery
 - a. saw fire
 - b. saw smoke
 - c. smelt burning
 - d. heard crackling
 - e. felt heat
 - f. heard alarm bell
 - g. other (specify)
9. Particulars of property

Year of construction (approx.)

Ground area of building sq.ft.

Number of floors

Approx. floor area sq.ft.
10. (a) Where fire started (dept., section etc. and item first ignited)
- (b) Where fire spread to
- (c) Area of fire (est. of area directly affected by fire and heat).... sq.ft.
11. Supposed cause
12. Description of damage
- Approx. direct financial loss due to (a) fire £.....
- (b) sprinkler action £..... (c) action of brigade £..... (d) TOTAL £.....
13. Method of extinction
14. (a) Fire fighting equipment available (please indicate any not in working order)
- (b) Are any fire prevention personnel employed? If so, what action did they take

(Questions 15 - 17. Please ring round letter(s) of appropriate answer(s) and enter details where applicable)

15. Sprinklers
 a. not installed
 b. operated and controlled fire
 c. operated and extinguished fire
 d. installed but failed to operate (give reasons below)
 e. operated but failed to control the fire (give reasons below)
 Reasons for failure

 Number of heads opened
 Description of System
 Maker and type

 Number of heads in system
 Date of installation
 Date of last inspection

16. Automatic Alarms
 a. not installed
 b. operated
 c. failed to operate (give reasons)

 Description of System
 Maker and type

 Date of installation
 Date of last inspection

 17. Fire doors
 a. not installed
 b. acted effectively
 c. failed (give reasons)

 Description of System
 Maker and type
 Date of installation
 Date of last inspection

18. Any other remarks. (Any relevant information not covered by other questions, including casualties, rescues, escapes etc., giving age, sex, method of rescue etc.)

Date Signature
 Designation

This investigation is being carried out by the Joint Fire Research Organization with the co-operation of a number of retail stores. The intention is to obtain information on the origin and growth of fire, and to ascertain whether there is any general pattern of fire behaviour in retail stores from which the effectiveness of methods of fire prevention and extinction may be assessed. The Organization is appreciative of the co-operation received and will treat all information contained in the forms in strict confidence. Any queries in connection with the form should be addressed to the Joint Fire Research Organization.

APPENDIX 2

LIST OF STORES CO-OPERATING IN THE SURVEY

Messrs ALLDERS LTD., North End to George Street, Croydon, Surrey.
 Messrs ARDING & HOBBS LTD., Clapham Junction, London S.W.11.
 The ARMY and NAVY STORES LTD., Victoria Street, London, S.W.1.
 Messrs JOHN BARKER & CO. LTD., Kensington High Street, London, W.8.
 Messrs BARROW'S STORES LTD., Corporation Street and Bull Street, Birmingham.
 Messrs BEALESONS, Commercial Road, Bournemouth, Hants.
 Messrs BENTALLS LTD., Kingston-upon-Thames, Surrey.
 BOOTS PURE DRUG CO. LTD., Head Office, Station Street, Nottingham.
 Messrs BOURNE & HOLLINGSWORTH LTD., Oxford Street, London, W.1.
 BRITISH HOME STORES LTD., Marylebone House, 129-137 Marylebone Road,
 London, N.W.1.
 Messrs BROWN, MUFF & CO. LTD., The Department Store, Bradford 1, Yorks.
 Messrs T.B. & W. COCKAYNE LTD., G.P.O. Box No.128, Sheffield.
 Messrs DEBENHAMS LTD., 91 Wimpole Street, London, W.1.
 Messrs DELLAPORTA'S LTD., High Street, Shrewsbury.
 Messrs DRUCE & CO. LTD., 56 Baker Street, London, W.1.
 Messrs JOHN FARNON LTD., Nun Street, Newcastle-upon-Tyne 1.
 GREAT UNIVERSAL STORES LTD., Universal House, 251-6 Tottenham Court Road,
 London, W.1.
 Messrs HENRY'S STORES LTD., Market Street, Manchester, 1.
 Messrs W. HODGKINSON LTD., Bridge Street, Warrington, Lancs.
 The INDEPENDENT STORES ASSOCIATION LTD., 36 Grosvenor Street, London, W.1.
 Messrs KAYES DRAPERS LTD., 9-11 King Street, Huddersfield, Yorks.
 Messrs. G. J. KEDDIE & SONS LTD., High Street, Southend-on-Sea, Essex.
 Messrs LEAK & THORP LTD., P.O. Box No. 25, Coney Street, York.
 Messrs JOHN LEWIS & CO. LTD., Chadwickham, 19 Bolsover Street, London, W.1.
 Messrs LEWIS'S LTD., 40 Ranelagh Street, Liverpool, 1.
 Messrs LILLYWHITES LTD., Piccadilly Circus, London, S.W.1.
 Messrs MARKS & SPENCER LTD., Michael House, Baker Street, London, W.1.
 Messrs MARMENTS LTD., 11-17 Queen Street, Cardiff, Glam., Wales.
 Messrs MARSHALL & SNELGROVE LTD., Oxford Street, London, W.1.
 Messrs DAVID MORGAN LTD., The Hayes, Cardiff, Wales.
 Messrs OWEN OWEN LTD., Head Office, Charles Street, Liverpool, 1.
 Messrs PETER ROBINSON LTD., 74 and 76 Western Road, Brighton, Sussex.
 Messrs ROBSON & SONS LTD., Furnishers and Decorators, 42 Northumberland
 Street, Newcastle-upon-Tyne, 1.
 Messrs SELFRIDGES LTD., Oxford Street, London, W.1.
 Messrs WATT & MILNE, 166-172 Union Street, Aberdeen, Scotland.
 Messrs F. W. WOOLWORTH & CO. LTD., New Bond Street House, 1-5 New Bond
 Street, London, W.1.

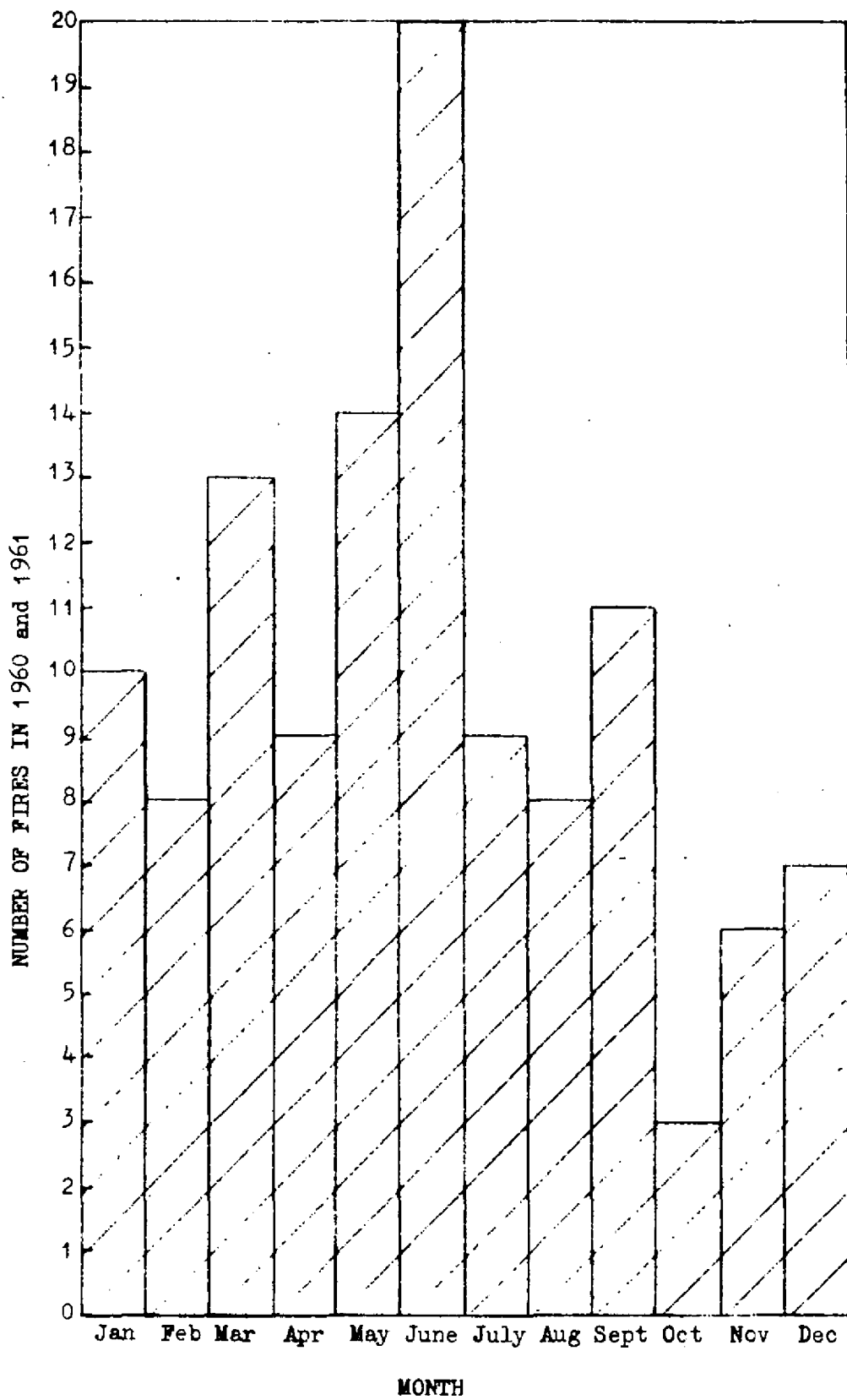


FIG.1. MONTHLY INCIDENCE OF FIRES IN DEPARTMENT STORES 1960 and 1961

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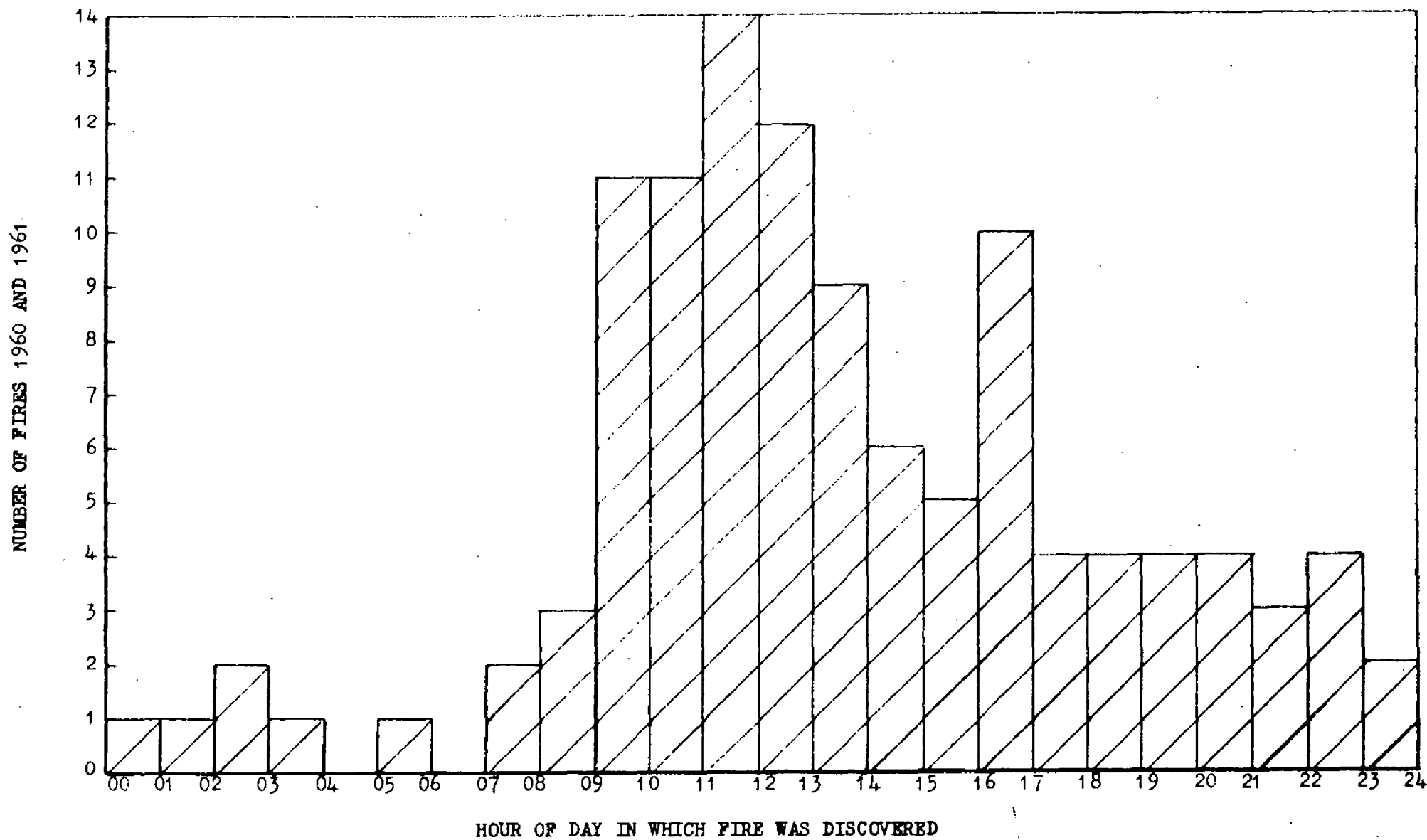


FIG.2. HOURLY INCIDENCE OF FIRES IN DEPARTMENT STORES
1960 - 1961

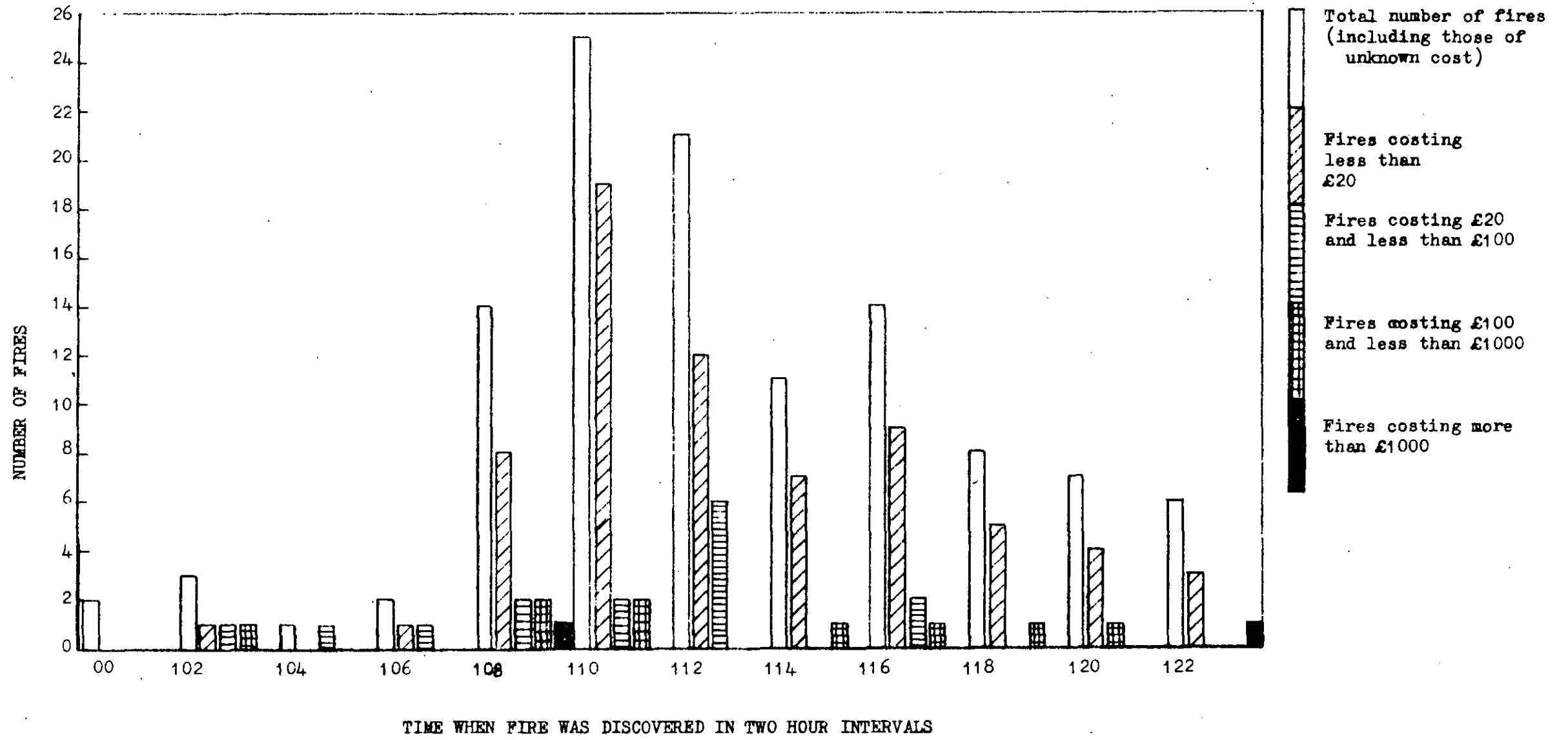


FIG.3. COST OF FIRES IN DEPARTMENT STORES 1960 - 1961

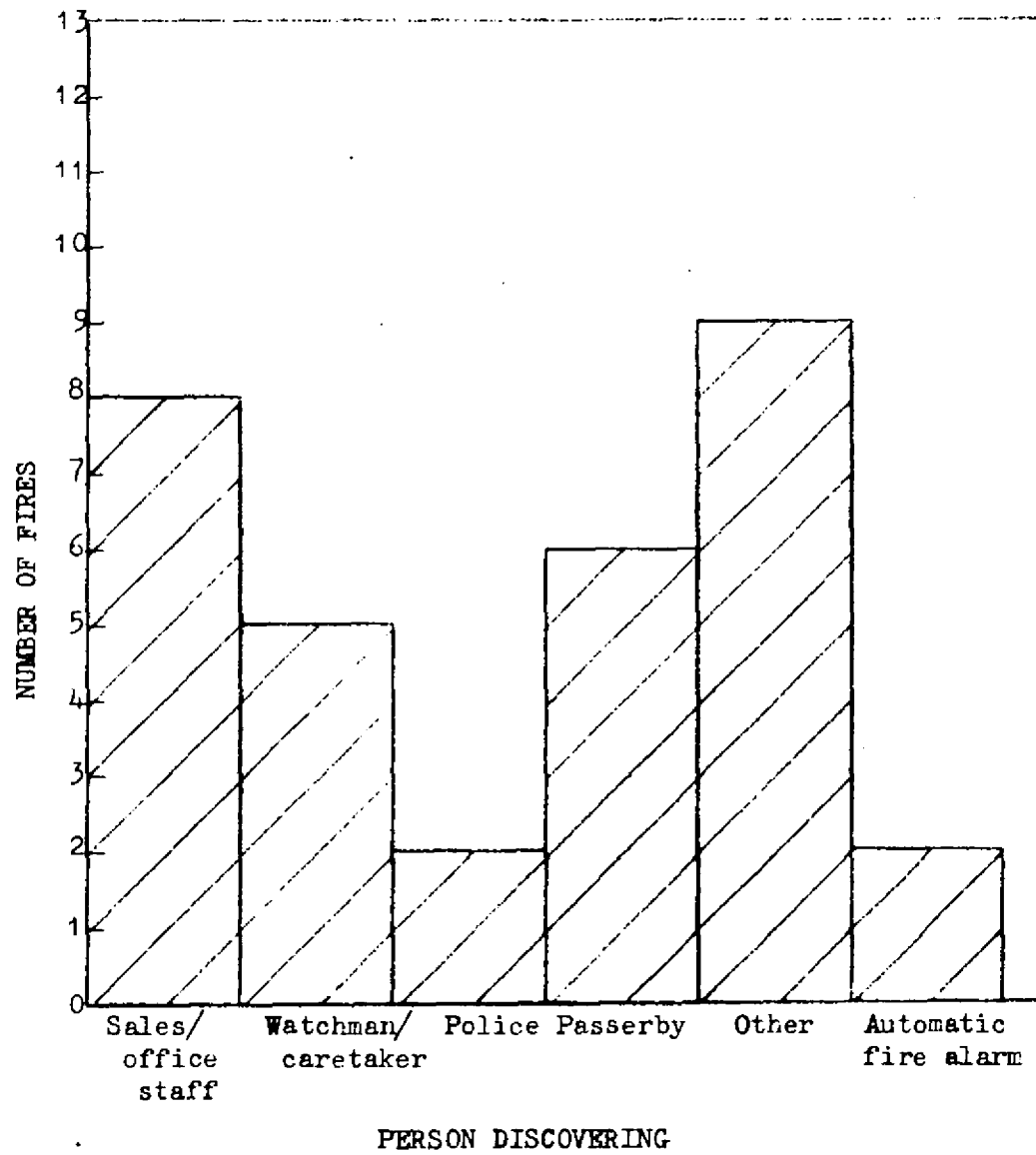


FIG.4(a) PERSON DISCOVERING FIRES WHICH OCCURRED AT NIGHT (18 - 06 hours)

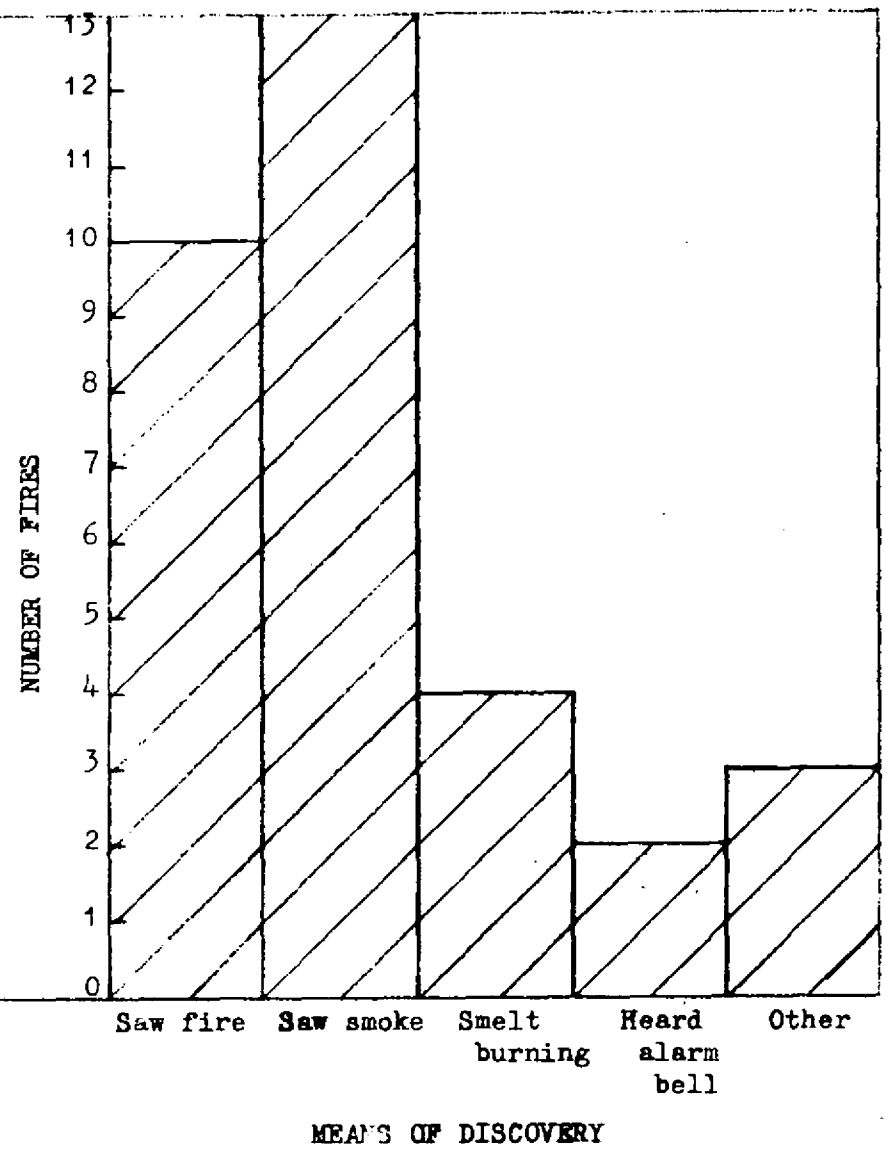


FIG.4(b) MEANS OF DISCOVERY OF FIRES WHICH OCCURRED AT NIGHT (18 - 08 hours)