

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

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INSPECTION OF A STOVE-ENAMELLING OVEN  
AT MESSRS. HOOVER, LTD.,  
HIGH WYCOMBE, BUCKS.

by

E. H. Coleman and G. W. V. Stark

Summary

A stove-enamelling oven in which a fire had occurred was inspected at Messrs. Hoover, Ltd., High Wycombe, Bucks.

It was concluded that the fire could have been initiated by ignition of paint drip residues by incensive particles introduced through the hot gas inlet.

Recommendations are made for avoiding a re-occurrence of the fire.

January, 1955.

File No. F.1000/32/30

Fire Research Station,  
Boreham Wood,  
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At the request of Mr. Tucker (Fire Prevention Officer, Buckinghamshire Fire Service) a stove-enamelling oven was inspected at Messrs. Hoover, Ltd., High Wycombe, Bucks., on 17th December, 1954, by Mr. E. H. Coleman and Mr. G. W. V. Stark.

A sketch of the oven is given in Figure 1. The oven, made by Messrs. Maehler, Ltd., is of sheet steel, approximately 9 ft. x 9 ft. by 8 ft. high, and is divided longitudinally into two compartments, each with its entry and exhaust flues and separate double doors.

The heat is derived from a gas burner on the top of the oven, and the hot combustion products are mixed with air from a fan and blown into the oven through ducts at the side. The hot air is introduced at the base of the outer side and exhausted at the top of the inside side (partition) wall. A portion of the gases is recycled.

The temperature is controlled by a thermostat in the top rear end of the left-hand compartment. The thermostat operates an indicator, which incorporates the setting control, on the side of the oven. The temperature is controlled by shutting off or turning on the gas which is re-ignited by an electrical spark device. The gas is also shut off when the doors are opened.

The oven was stated to be operated between 400°F and 375°F. The temperature distribution in the oven was measured by Messrs. Hoover's staff subsequently to the visit. The temperatures are shown below; they were obtained under normal working conditions.

Temperature distribution in drying oven

Site	Temperature °F
Bottom of duct	420
Middle of oven	365
Top of duct	370
Temperature shown by indicator	390

The metal ware to be enamelled is dipped in an oleo-resinous stoving paint with a white spirit solvent. After dipping, the goods are allowed to drain and then suspended from hooks on an angle iron trolley, which, after a further draining period is pushed into the oven for stoving, which takes about one hour. The steel trolley carries a drip tray at its base. Some days before the incident Messrs. Walter Kidde had installed a CO<sub>2</sub> protective system, which was interlocked so as to turn off the gas and switch off the fan.

On the day of the fire about one hour after the rack of goods had been inserted, the operator noticed a red glow at the base of the right-hand oven. He immediately operated the CO<sub>2</sub> apparatus and 180 lb of the gas was discharged, and the fire was controlled. When the oven was opened the fire was seen to be at the front end of the drip tray and underneath the hot air inlet. The tray was removed and the fire was extinguished with a further 120 lb CO<sub>2</sub>.

The tray contained a layer about  $\frac{1}{2}$  in. thick of solid paint residues. The residues could be ignited with a match and burned readily, and the gas burner was pitted and showed signs of burning and corrosion.

After the fire Messrs. Hoover's electrician inspected the oven and found that during the installation of the CO<sub>2</sub> apparatus the fan had been re-connected wrongly. This reduced the draught to the oven, so that the gases would be hotter than normal. The operator thought that the right-hand oven seemed to be hotter, and the left-hand oven cooler, than normal.

#### CONCLUSIONS

It was considered that the fire could have been initiated by incandive particles of soot, or of hot iron oxide. These could have been carried from the burner and have fallen on to the heated paint drippings and ignited them.

It is not considered that ignition of white spirit vapours occurred, although white spirit has an auto-ignition temperature of 480° - 500°F, (a temperature which might have been attained when the oven was over-heating) since, from consideration of the dipping and draining operations, it is unlikely that there would have been flammable concentrations of vapour in the oven, even with the reduced draught. Had such a concentration existed an explosion would have been expected.

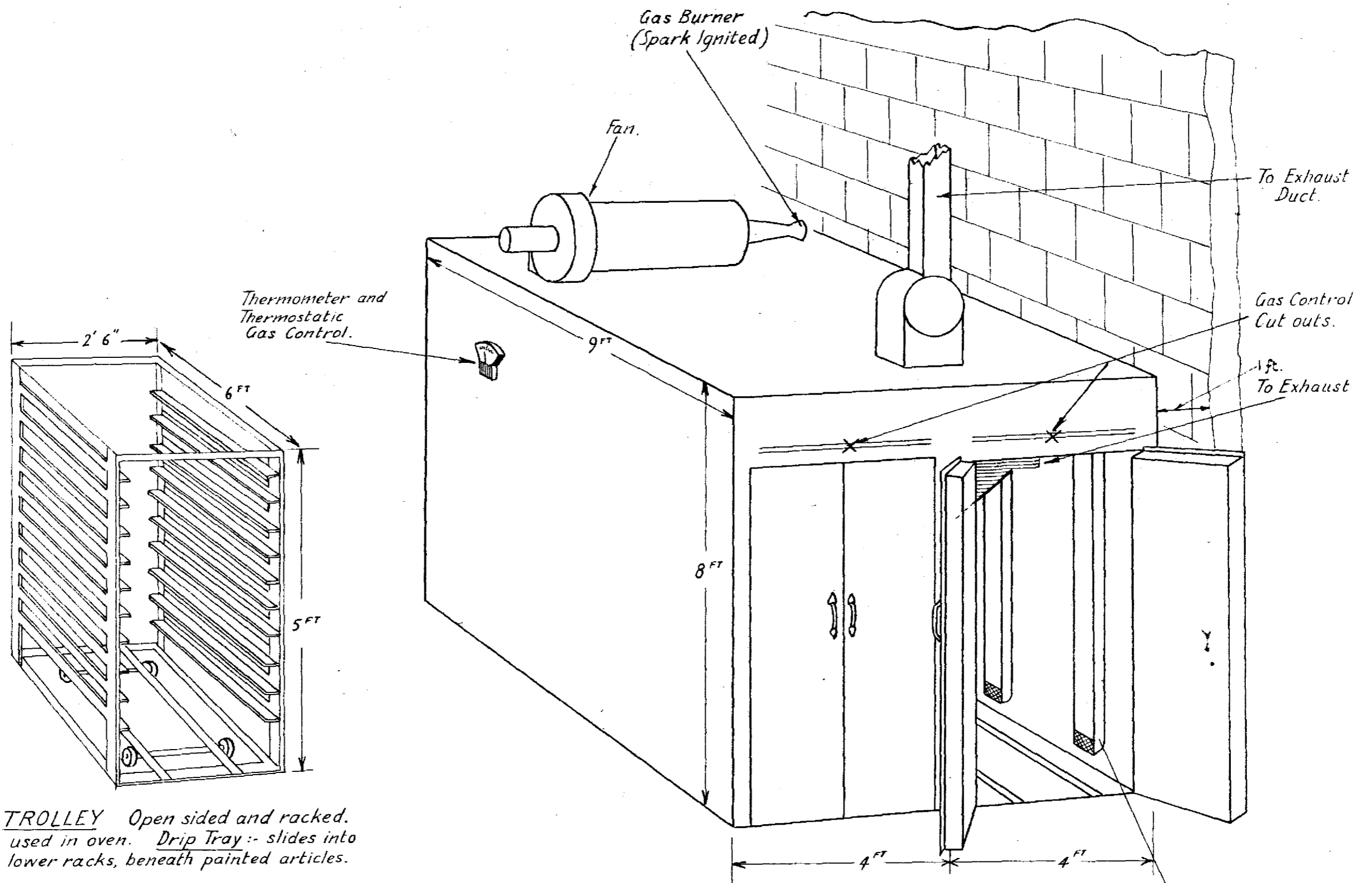
#### RECOMMENDATIONS

It is suggested that paint residues should not be allowed to accumulate in the drip tray, and therefore the drip tray should be changed immediately before inserting the trolley in the oven.

The discharge of hot particles should be prevented by regular and frequent cleaning of the flues. A further precaution would be the insertion of baffles or a wire mesh screen in the inlet duct at the point where the hot gases enter the oven. It would be advisable to consult the makers of the oven about this.

BATCH OVEN. HOOVER LTD, HIGH WYCOMBE.

Not to Scale: Approximate



TROLLEY Open sided and racked. used in oven. Drip Tray :- slides into lower racks, beneath painted articles.

NOTE W. Kidde C.O<sub>2</sub> System. (Fixed installation) fitted at rear of oven. Control valve on cylinder Rear Right.

Inlets (3 per section) For Hot Gases.

F.R. NOTE 156

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