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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANIZATION, AND THE BUILDING RESEARCH STATION

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REPORT OF A VISIT TO THE JAGUAR CAR FACTORY, COVENTRY

by

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Summary

A brief description is given of the fire which occurred at the Jaguar Car Factory in February 1957 and the factors which contributed to the rapid growth of the fire are considered.

April, 1957.

Fire Research Station,
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Introduction

A visit was made on 14th February, 1957, to the scene of the fire which had occurred at the Jaguar Car Factory on 12th February. Assistance during the visit was given by Mr. Boissonade, Chief Fire Officer, and Mr. Brown, Deputy Chief Fire Officer, Coventry, Mr. Muslin, Safety Officer, Jaguar Cars Ltd., and Mr. Entwistle, Factory Inspector, Coventry. This report is concerned primarily with the influence of the fire on the building and its contents, and therefore the work of the Fire Services is not considered in detail.

Description of the factory and its contents

The building consisted of a large single-storey structure 460 ft. wide by 1530 ft. long which provided the production area of the Jaguar factory. Steel saw-tooth, or north light, roof trusses of 30 ft. span were supported on steel stanchions, none of the internal steelwork being protected against fire. The roof covering was a form of corrugated steel sheeting protected against corrosion by a factory-applied bituminous coating on both sides. Below the roof covering was a lining of fibre insulation board supported in metal tees, which in some bays were fixed below the purlins and in the remainder above the purlins. In portions of the roof there was thus an unstopped air gap between the roof covering and the lining. The north lights in the bays were wired glass in patent glazing. Roof ventilators had been installed about 70 ft. apart along the ridge of each bay. External walls were of 9 in. brickwork. Across the building at its mid-point was the main entrance, termed the link road, which was bounded by block walls built up to the underside of the roof lining, but these walls were not continuous across the building and therefore did not form a complete separation between the assembly lines and the machine shop, etc. (see Figure 1).

The north end of the building, which contained stores on two levels for finished components and tyres, was separated from the assembly area by wire mesh and sheet partitions. Adjoining the tyre stores was a saw mill similarly screened and along the same external wall near the centre of the building was the paint spraying shop which was separated from the rest of the production area by partitioning of hardboard with glazing of plain glass.

Description of the fire

The following description of the course of the fire is based on information supplied by the fire services.

The fire started at the north end of the building in the region of the tyre stores and saw mill at about 5.45 p.m. shortly after work had finished for the day. It was observed in its early stages, but gaining a hold in the tyre store it grew with such rapidity that the Works Fire Brigade, which together with the Coventry Fire Brigade had been immediately called, was unable to control it. Flames soon reached the combustible roof lining and within a few minutes had spread along the whole length of the bay involved. Smoke and hot gases mushroomed out from bay to bay and were augmented by the products of combustion from the roof covering and lining. Owing to the absence of any venting in the roof specifically designed to act as a flue for a fire, the smoke and hot gases were initially confined almost entirely within the

building. Fire spread to the contents of the building from the roof assisted by burning material falling on to combustible material in the assembly lines such as fabrics, tyres and flammable liquids. It was emphasised that the fire in the roof was always some distance in advance of the fire on the floor.

The Coventry Fire Brigade arrived in about five minutes after receiving the call and was able to enter the building by the link road, but could do little to halt the spread of the fire because of darkness and heavy smoke until the explosion of an oxygen cylinder caused a partial collapse of the roof in the ninth and tenth bays, thus venting the fire. The relief to the firemen was immediate and from striving merely to check the advance of the fire they could proceed to extinguish it. Water supplies were ample and the fire was under control in a little over three hours from the time the Brigade arrived.

Effect of the fire on the building

The fire was checked in its progress at the thirteenth bay from the north end of the building and twelve bays suffered damage to various degrees. Apart from the place where the explosion occurred, collapse of the roof was confined to the area where high concentrations of combustible materials were present. Stanchions in this area, which had combustible material stacked close to them, had suffered severe distortion (Plate 1a,b). The bituminous coating of the roof sheeting had completely burnt away in most of the bays, but in places the mineral fibre base of the coating was still adhering to the underside of the sheets (Plate 2a). Near the limits of the fire spread where the underdrawing had not completely disintegrated, the bituminous coating above the lining appeared to be still adhering to the metal (Plate 2b). Except in areas of intense local heat the roof trusses had not failed and in places seemed relatively free from distortion. Large areas of glazing were still intact. Where the fire was most intense some fusing of the glass had occurred (Plate 3). Elsewhere sheets of glass had dropped owing to failure of the patent glazing, probably by melting of the lead casings of the bars.

Discussion

In common with the majority of other large fires the rapid and extensive spread of this fire is not attributable to one cause alone. There were several factors, none of which may have been decisive in itself, but which, in conjunction with other favourable circumstances, proved capable of producing a major fire. Given a source of ignition in the right place and at the right time, a complete burn-out of the building was possible.

Precautions which should be taken to prevent a small fire becoming a large one are well known. It will be seen from the following list that the factory was deficient in many features regarded as important for fire protection, but it should not be assumed that reasonable fire safety could not be attained without taking all the precautions described.

1. There was no sprinkler system.
2. There were excessively large undivided areas and in particular no structural separation of the high hazard compartments from the remainder. Compartmenting by the proper use of fire walls can confine a fire to one portion of a building. Freedom from division walls was a production requirement of the factory, but this would not preclude the complete enclosure of the areas of high fire hazard by fire resisting partitions. The chance of a major fire starting in the remainder of the assembly was probably small, since the fire load was low.

3. The structural steelwork was unprotected. Extensive collapse of the roof of a large single storey building can restrict considerably fire fighting operations and may lead to the building becoming a total loss. Protection of the internal steelwork against fire is not a bye-law requirement for single storey buildings but it may sometimes be a worth-while measure. In the Jaguar factory the nature of the construction rendered complete protection difficult and costly.
4. The roof lining was combustible and had a surface of rapid flame spread. It could also produce large quantities of smoke.
5. The roof covering had a combustible coating which could become molten when heated and fall as flaming drops, besides adding to the volume of smoke.
6. There was an unstopped cavity between the lining and the roof covering in the bays first involved.

It has not been established that the spread of fire in the cavity was the primary cause of the rapid development of the fire. It is possible that the initial spread was on the under surface of the fibre insulation board which burnt and broke up, the burning fragments falling on to flammable materials below. The bituminous coating of the roof covering would then be affected and would drop, adding fuel to the fire on the floor.

7. There was no provision in the roof for venting the products of a fire. The normal roof ventilators were inadequate to deal with the large volumes of smoke and hot gases generated in the fire and so prevent their spreading out under the roof. If it is essential to have large areas of unrestricted floor space in a building, the basic principle of compartmenting by fire walls can be replaced to some extent by making provision for the escape of products of combustion and restricting their lateral spread by means of fire curtains in the roof space. Vents of suitable size properly spaced should be designed to open by means of fusible links. When combined with fire curtains in the form of screens of non-combustible sheeting, the vents provide a flue system which can cope with the products of combustion from a fire starting in any part of a building.

There were some factors which were favourable from the fire-fighting point of view and enabled the fire damage to be confined to about one quarter of the building. The information supplied is clear on the following points:

1. The fire was discovered in its early stages and the fire brigade was called without delay.
2. It was possible for the fire brigade to enter the building in advance of the fire and attack it from inside.
3. There were ample supplies of water.
4. An explosion occurred which damaged the roof and vented the fire thus removing the smoke and hot gases which were the fire fighters' major handicaps.

Conclusions

The fire at the Jaguar Car Factory illustrates the consequences of the neglect of the basic principles of fire protection. There was no separation of the areas of high fire hazard (stores and saw mill) from the main production areas or assembly lines. The roof sheeting was coated with combustible material, the internal lining was combustible having surfaces of rapid flame spread and the entire building was without any fire resisting sub-divisions. Such a layout allowed the fire to spread rapidly along the combustible roof lining leaving large parts of the structure to a great extent undamaged but involving valuable products on the floor below. The resulting fire loss would seem large if considered in relation to the fire load of the building.

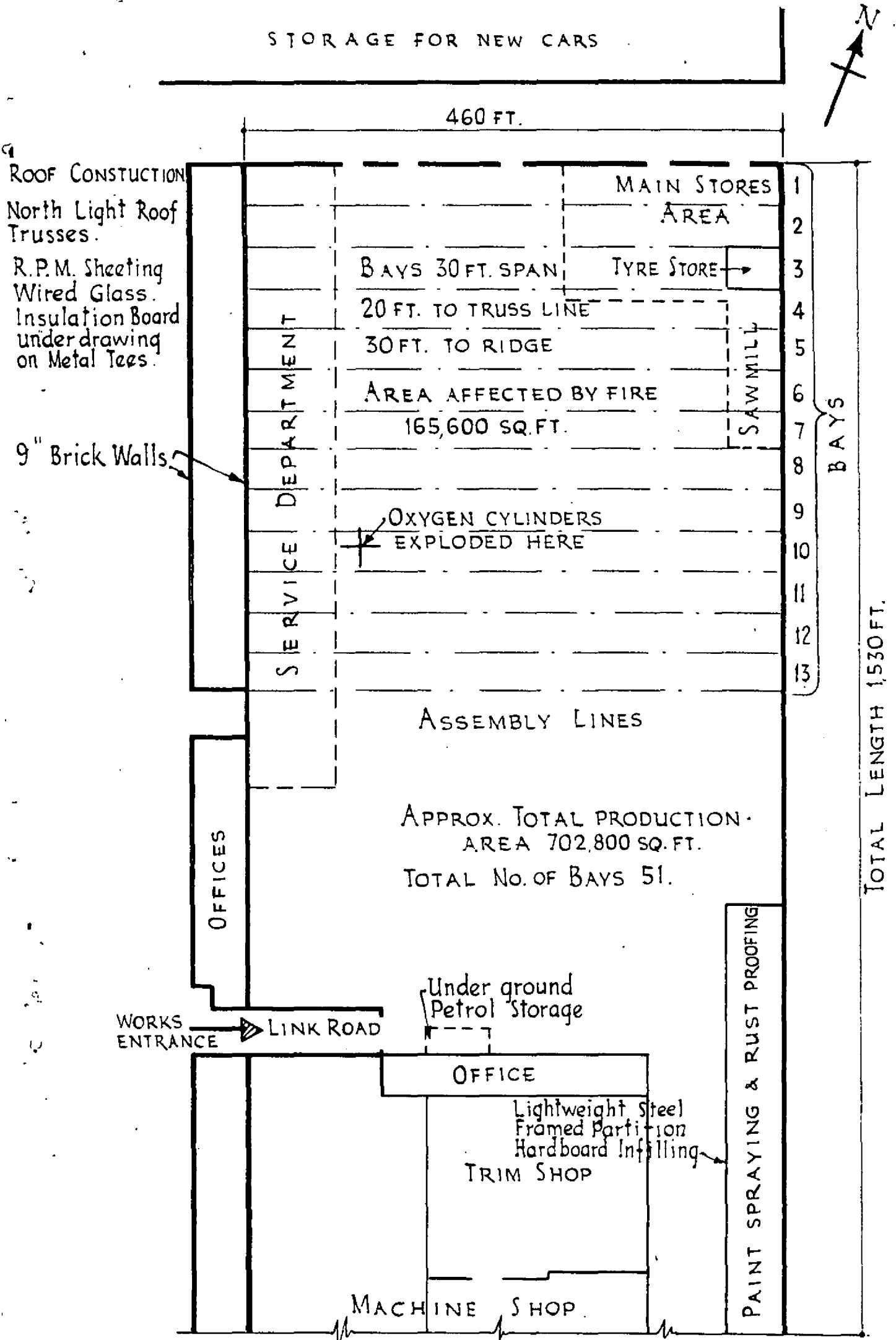


FIG. 1. LAYOUT OF PART FACTORY AREA
 JAGUAR CAR FACTORY: COVENTRY.

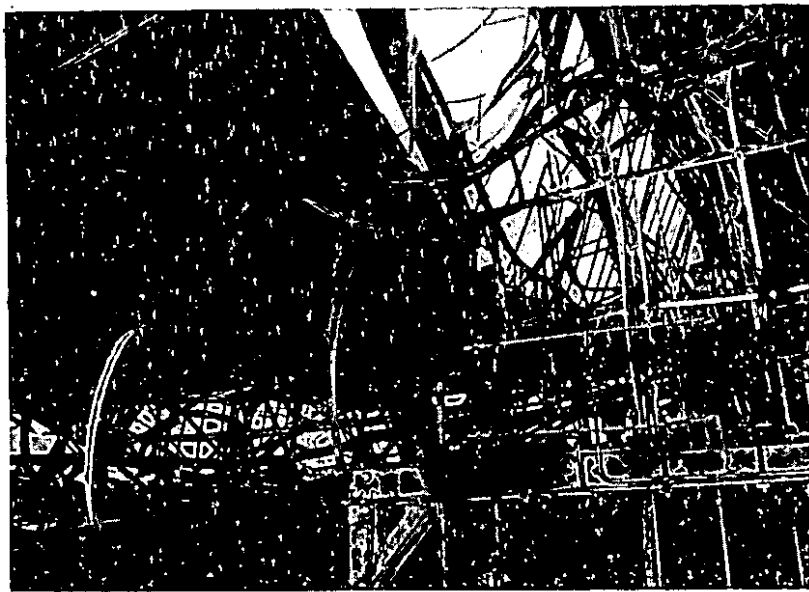
SCALE: 1 IN. TO 100 FT.



(a)

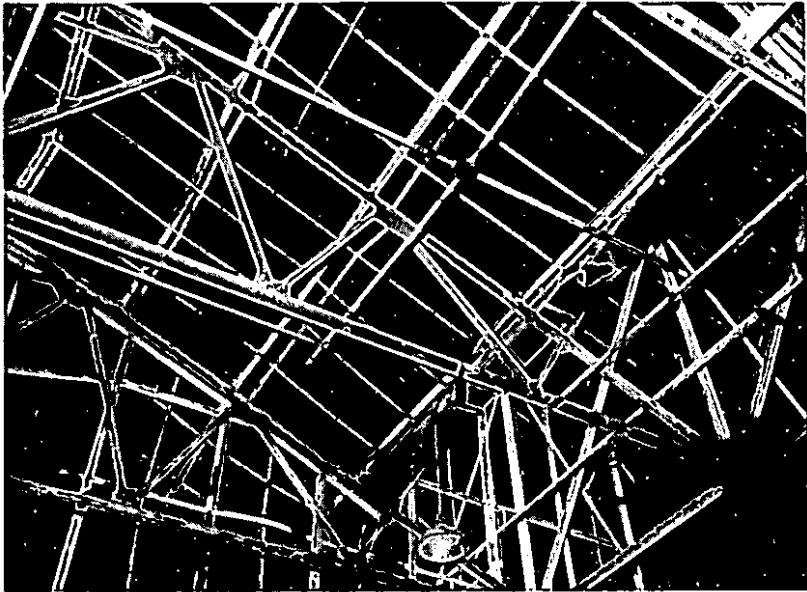


(b)

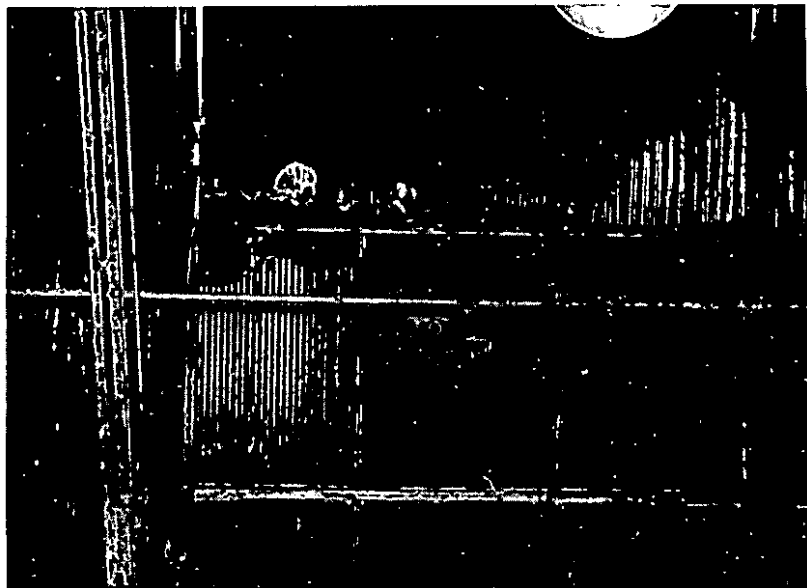


(c)

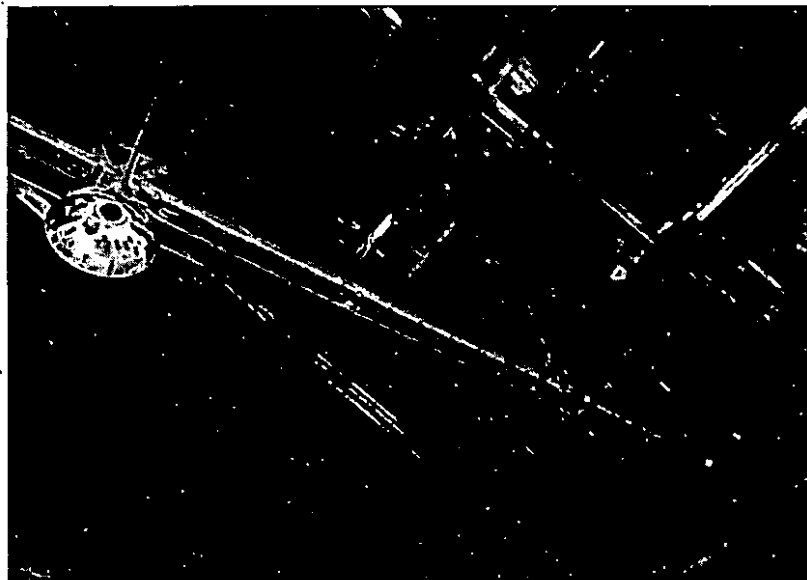
Plate 1. Interior of building showing distorted steelwork near seat of fire. (57/102)



(a)



(b)



(c)

Plate 2. Underside of roof away from seat of fire.
(57/102)

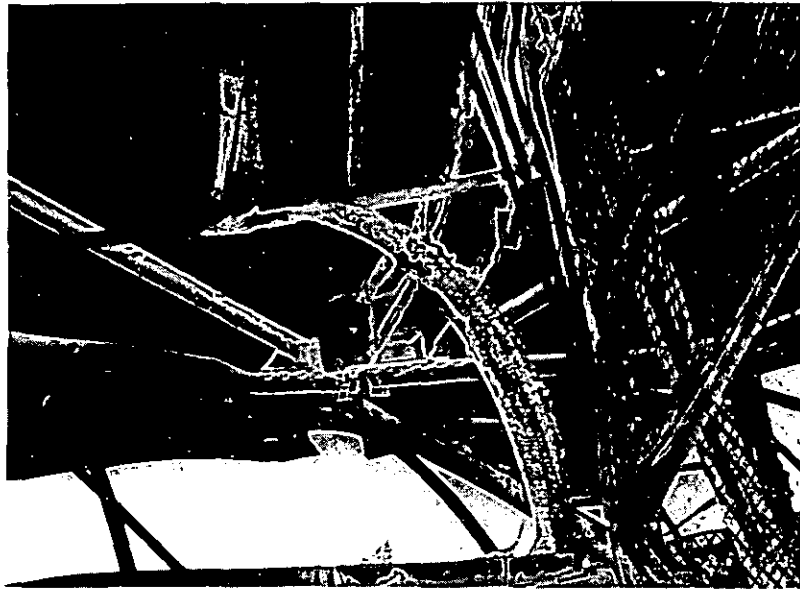


Plate 3. Fusing of wired glass in north light.
(57/102)