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# Specialized Rail Car Production

WARE
HERTFORDSHIRE
ENGLAND

D. WICKHAM AND COMPANY LIMITED

# SPECIALIZED RAIL CAR PRODUCTION

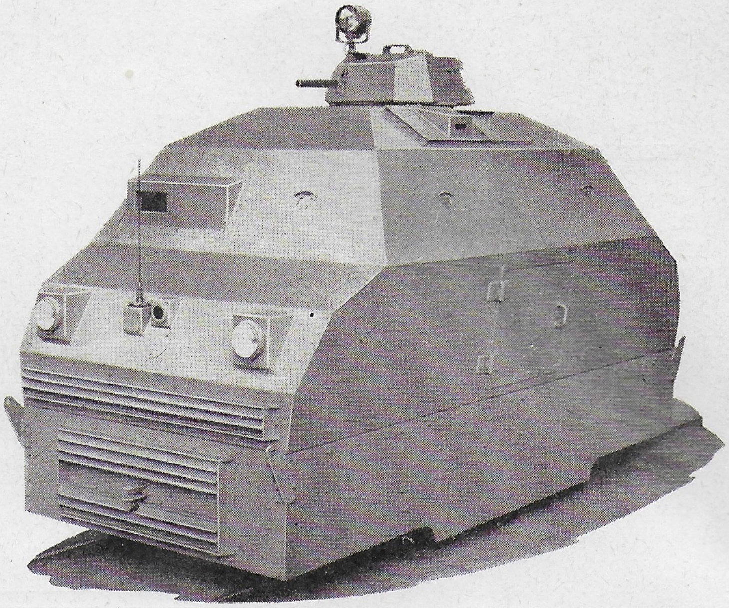


*Fig. 1. Light armoured rail car for Malaya.*

GENERAL standardization of railway passenger cars is almost impracticable owing to the wide variety of traffic requirements, operating conditions and geographical considerations in various parts of the world. One becomes accustomed to the standardized nature of railway carriages and goods wagons in Great Britain, but a visit to D. Wickham & Co., Ltd., of Ware, provides a great deal of food for thought when considering such countries as Malaya, Peru and China.

It is more than 60 years ago that Dennis Wickham, owner of a century-old Hertfordshire brewery, wanted to make clear, sparkling beer. The necessary plant was not available, so he turned his attention to making his own plant. Its success was evidenced by the fact that other brewers soon wanted similar plant, which he undertook to make for them. The fame of his machines grew until he found all his time was occupied in their manufacture. When he died in 1910, stagnation came to the small engineering works he had built, and in 1924 it was sold to the present management.

The new management were something of specialists in the manufacture of motor cars and railway track, and they began in a small way to manufacture railway motor cars for track inspection and maintenance. Rapid success was achieved and world-wide markets were obtained. Their success was not confined to the production side; on the design side a great deal of pioneering work was done and Wickhams were among the first to incorporate correctly designed welded steel frames, roller bearing axle boxes, under-slung springs and all-steel bodies.

The next step in development was the building of passenger rail cars, eliminating the conventional underframes and making use of all-steel bodies in good stout, solid drawn steel tube of square section. These coaches are 30 per cent lighter than the conventional coach, but provide a much greater degree of safety for passengers as compared with the type of coach incorporating heavy underframes and wooden or light steel bodies.

In the few years preceeding the second world war, production was such that they were ready to take their share in Britain's war effort when it was needed. First, came a motor rail trolley which carried a target and was automatically accelerated or braked by ramps between the rails, affording the guns moving battle-practice targets. Practically all artillery ranges were equipped with these motor rail trolleys. Subsequent manufacture included cable layers, balloon winches, transporter winches, rigging cranes, workshop cranes, gun mounting and aircraft component manufacture, and the production of manganese bronze castings.

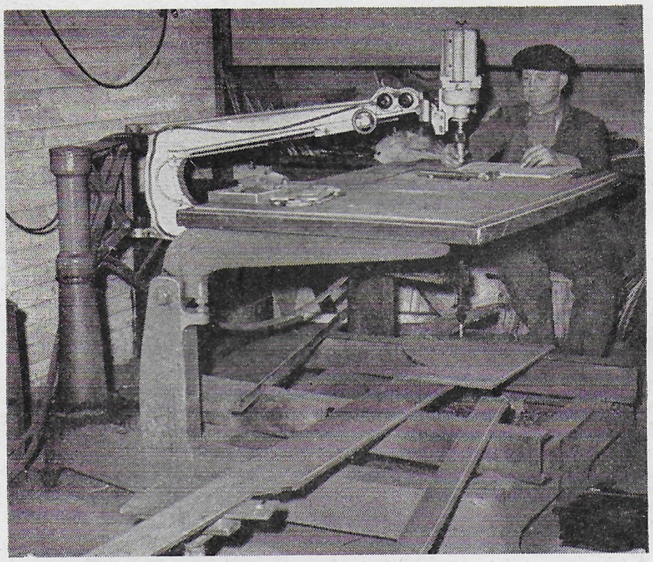
Now in times of so-called peace a considerable proportion of the production of D. Wickham has recently been taken up in the manufacture of formidable-looking armoured rail cars for the Malayan Railway. A finished rail car is shown in Fig. 1 which to many must be reminiscent of the wartime production of light armoured cars. The purpose of these armoured rail cars is to provide protection to rail transport by running one in front and one behind a train, ensuring respectively a clear track and freedom from attack from the rear.

In the metal preparation shop many machines are in use which are of the latest type. Fig. 2 shows a Hancock electric tracer head for the profile gas cutting of steel shapes. This machine is used for a wide variety of sheet thicknesses. The material ranges from mild steel to armour plate.

One of the very latest types of fusion cutting machines is shown in Fig. 3, which in principle is a large band-saw working at extremely high speeds—reference to this machine has already been made on several occasions in this publication.

Abrasive cutting is also found to afford considerable saving, a typical machine of fairly large capacity being shown in Fig. 4. This machine was manufactured by Wadley Mfg. Co., Ltd., and is fitted with a 16-in dia abrasive disc cutter $\frac{1}{8}$ in thick. The peripheral speed is 12,000 ft/min, and its great advantage is in the speed of cutting and its ability to cut light section clean and square without local deformation.

Fig. 5 shows another abrasive cutter of rather smaller capacity, manufactured by A. & S. Osmond, Ltd. This machine is particularly useful for cutting the tube and affords a great economy by virtue of the fact that it can use the blades from the previous machine when their diameter has been reduced to about 12 in. For very heavy sections the Fluifeed cold saw, as shown in Fig. 6, is used. This machine, manufactured by Noble & Lund, Ltd., can give cutting speeds of 30, 45 and 64 in/min with the 16-in dia blade in use.



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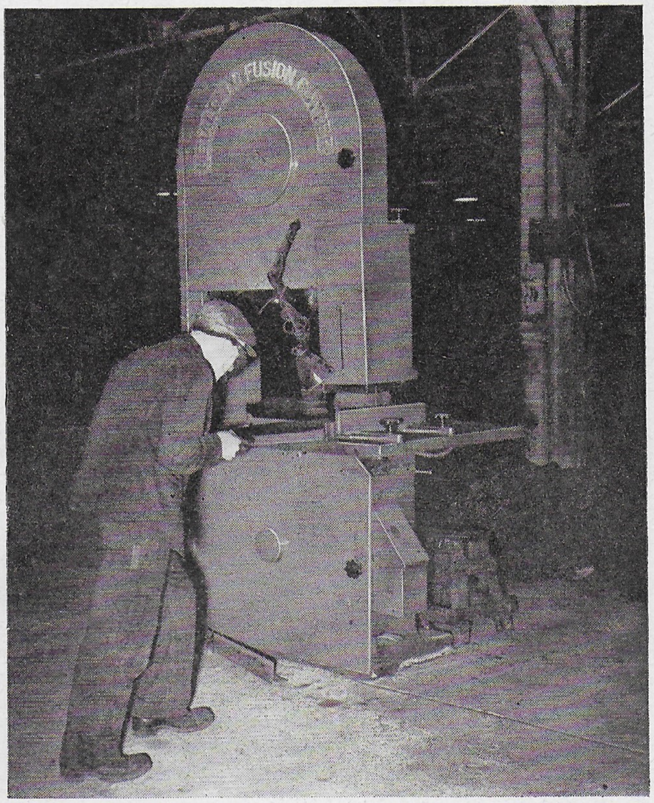

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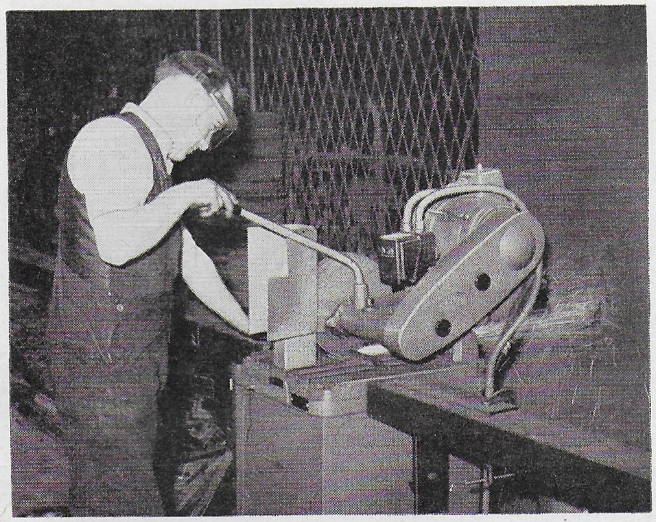

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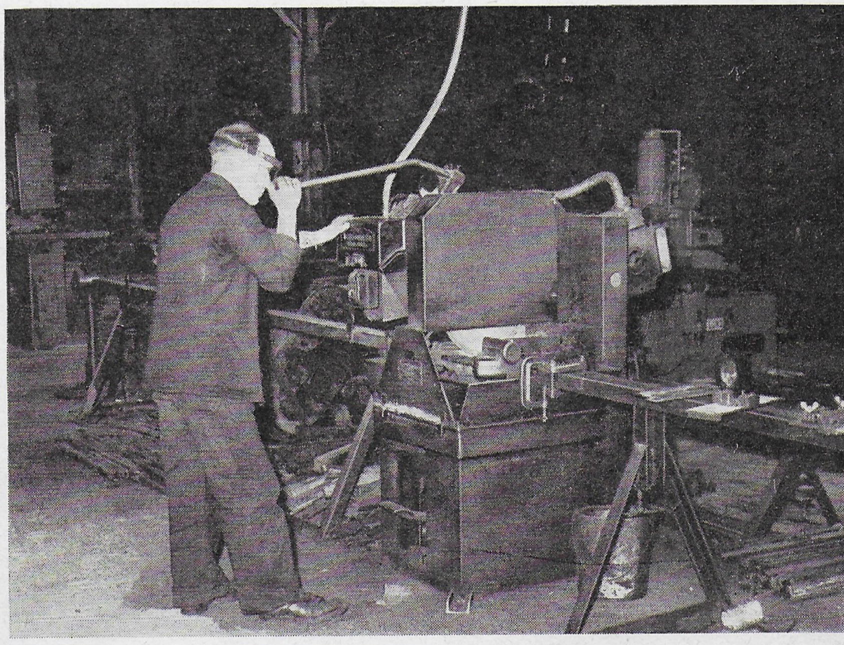

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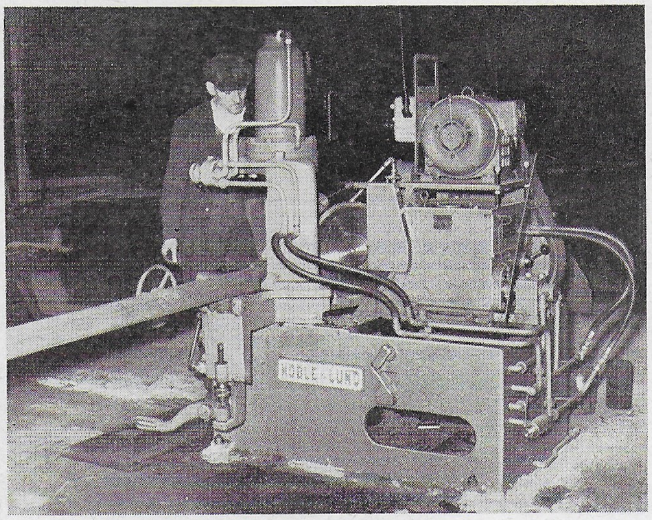


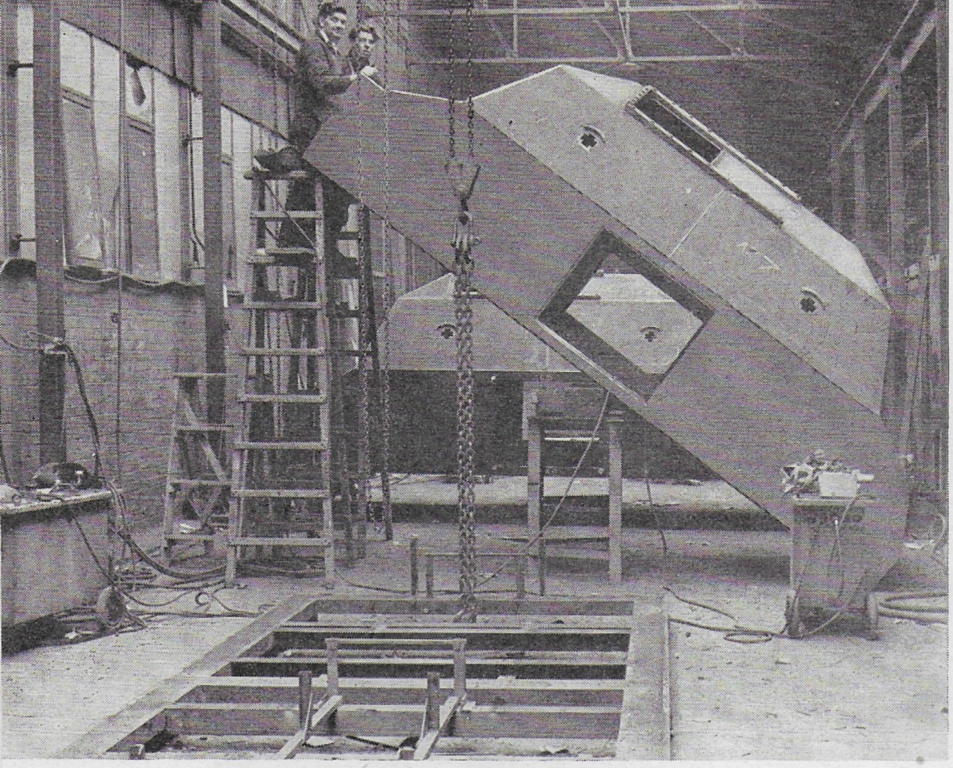

*Fig. 2. Hancock oxygen-cutting machine.*

*Fig. 3. High-speed Metalclad fusion cutter. (George Cohen, Sons & Co., Ltd.)*

*Fig. 4. Abrasive cutter fitted with 16-in dia disc. (Wadley Manufacturing Co., Ltd.)*

*Fig. 5. Smaller abrasive cutter, which takes discarded discs from the Wadley machine. (A. & S. Osmond, Ltd.)*

*Fig. 6. Fluifeed cold saw with 16-in dia blade for cutting heavy sections. (Noble & Lund, Ltd.)*



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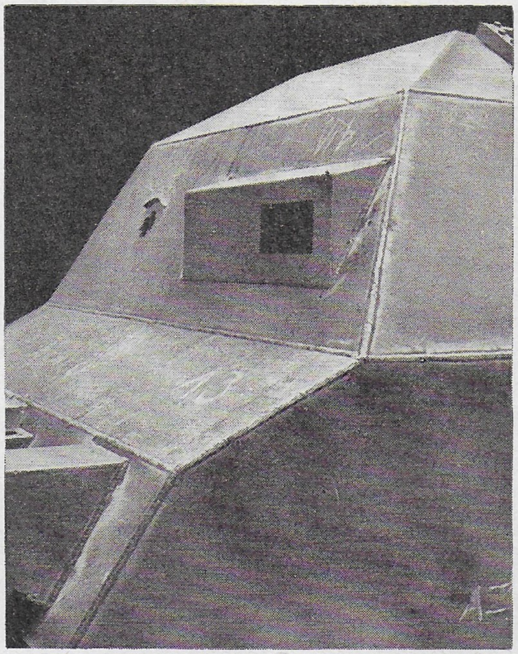

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Fig. 7. *Jigs for armoured hull (foreground) and hull positioned for welding (background).*

Fig. 8. *Close-up of front corner of armoured hull.*

Fig. 9. *Close-up of front of hull inside.*

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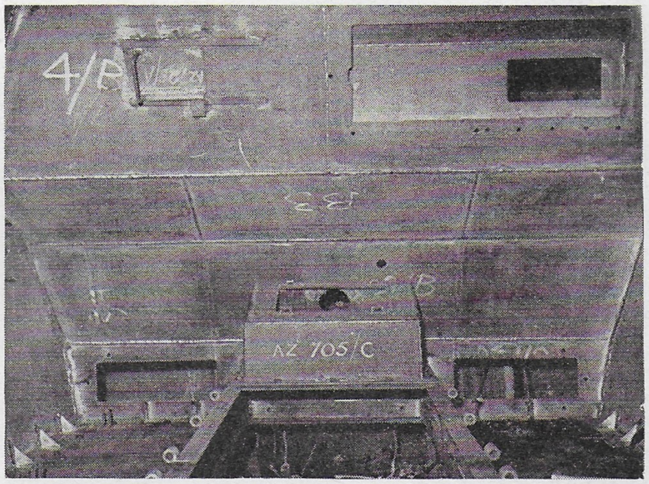



Another Noble & Lund machine of a similar nature uses a 22-in blade and this machine is reserved for extremely large work.

**Production of Armoured Rail Cars**

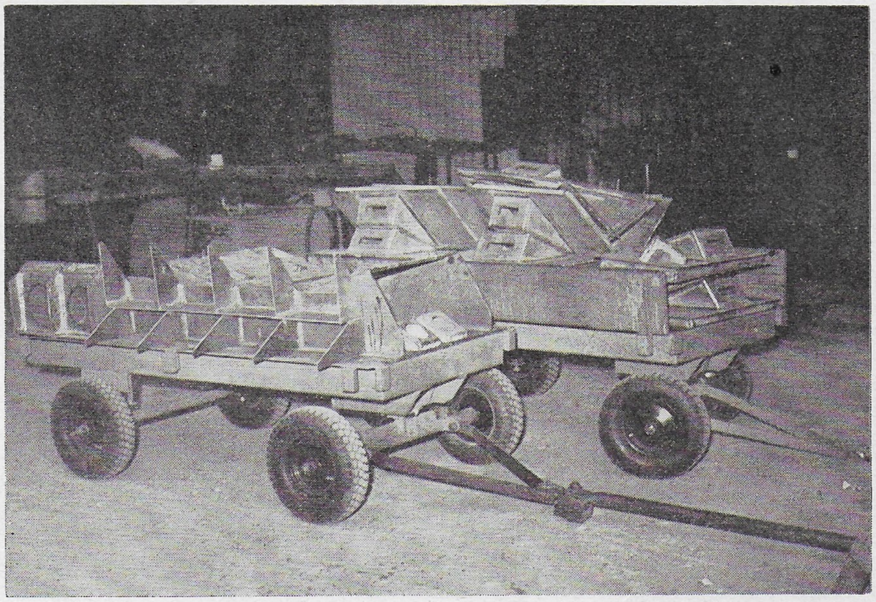
The armoured rail car, as supplied to the Malayan Railway through the Crown Agents for the Colonies, is made of armour plate of varying thickness of the following typical analysis: C, 0·29 per cent; Si, 0·22 per cent; Mn, 0·52 per cent; S, 0·037 per cent; P, 0·030 per cent; Ni, 0·88 per cent; Cr, 1·49 per cent; and Mo, 0·47 per cent.

To prevent cracking, austenitic electrodes are used and all materials preheated to 200 deg C in the vicinity of the weld immediately before welding. Attainment of the correct temperature is indicated with the use of Tempilstiks.

A striking feature in the manufacture of hulls for the armoured rail cars is the use of an absolute minimum of jigs. Reliance is placed upon the extremely accurate plate preparation, both as regards overall size, and the vee for welding. Single vees are used throughout.

Fig. 7 shows in the foreground a base jig, upon which the main hull plates are assembled and tacked, local clamping being accompanied with the use of Venner magnetic welding clamps which are very small in size but can exert a maximum force of 175 lb.

Fig. 10. *Sub-assemblies for hull of armoured rail car, all in armour plate.*



After having tacked the floor members and hull the assembly is taken off the base jig and positioned as shown in the background of Fig. 7 to facilitate downhand welding. 6-s.w.g. electrodes are used throughout, two runs being made outside and one inside. For downhand welding either Armoid, Armex 2 or B.P.5 electrodes are used and for the limited amount of overhead welding Armoid 2 and Armex 3 electrodes are used. It will be noticed that most of the main hull welds are of the open-corner type.

A very important feature in the manufacture of these hulls is the grinding out on the reverse sides of the welds before the sealing run is put in. This is done with the use of cloth-bonded grinding discs operated in small power hand tools. The trade name of the discs is Unilastic and they are manufactured by The Universal Grinding Wheel Co., Ltd., and are virtually unbreakable. They grind to the exact contour required and are extremely quick in operation when used at 6,000 r.p.m. in a portable grinding tool of the Hicycle variety. All the high-speed grinding tools and power units used on this work are manufactured by the Consolidated Pneumatic Tool Co., Ltd.

Fig. 8 shows a close-up of one of the front corners of the hull and gives a clear impression as to the extremely high quality of the welding. Fig. 9 is a near view of the interior of the hull looking towards the front, and here again the quality of welding can be judged by the uniformity of the back sealing run. The armoured hull consists primarily of the side plates, front plate and top plate, but a very large number of small sub-assemblies goes into its manufacture, a selection of which is shown on the two trolleys in Fig. 10.

Fig. 11 shows a production line for the armoured hull as it is nearing the final assembly. Fig. 12 shows another view of the hull from the side, and in the foreground can be seen the chassis and under carriage, incorporating a 60-h.p. Perkins diesel engine.

**Production of Passenger Rail Cars**

One of the most important items in the production of rail cars is the bogie frame, and correct design and welded fabrication have been used together in the development of the type of frame shown in Fig. 13. The main members are of box section, built up from flat plate which has been previously profile cut and formed to shape. The result is a comparatively light but extremely rigid and strong frame.

All Wickham passenger rail cars embody one important principle, namely the elimination of all unnecessary weight, while preserving at least as great if not a greater degree of strength, endurance, safety and comfort as with orthodox methods of construction. This end has been achieved by the use of logical design, high-grade materials and the correct use of electric welding. The all-steel bodies of Wickham cars are fabricated with solid drawn tube of square section and in recent years leading design experts in this country have all unanimously recommended the box section as being the best section for such duty. The body itself is designed as a box girder, thus enabling the conventional underframe to be entirely eliminated, and is somewhat comparable with the monocoque type of construction as used in aircraft and some motor cars. The first rail car built on this principle in 1937 has given entirely successful results, the body frame showing no sign of deterioration or failure despite continual overloads. For the past three years this first car has been subjected to additional buffing and traction loads for which it was not designed and subjected to loads which have been unquestionably a most severe test, but which have shown up no defects. The light-weight nature of Wickham passenger cars was inspired originally by the needs of various mountain railways where the elimination of excessive weight is of primary importance.

On ordinary railways, however, the light-weight rail car provides comparable advantages and, in particular, increased acceleration for a given power. These are most valuable factors, particularly on branch lines with numerous stops. This type of design and manufacture obviously results in more economic running because the gross load is hauled for lower cost. The economic advantage is further magnified by virtue of the fact that the gross load includes a greater ratio of pay load to total load.

In a passenger rail car a third and vital factor is the comfort of the passenger and this has been the subject of careful thought so that the revenue-earning capacity of the Wickham passenger car can be exploited to its fullest extent.

The ultra-light rail car has been criticized for its poor riding properties, especially on bad tracks, the idea apparently being that the only way to cure the trouble is to increase the weight. Increasing the weight, of course, automatically reduces the pay load and is therefore the antithesis of logic. The real answer to the problem is correctly designed springing, a subject which has been closely studied by Wickhams with the result that the Jamaican Government

*Fig. 11. Production line with armoured hulls nearing completion.*

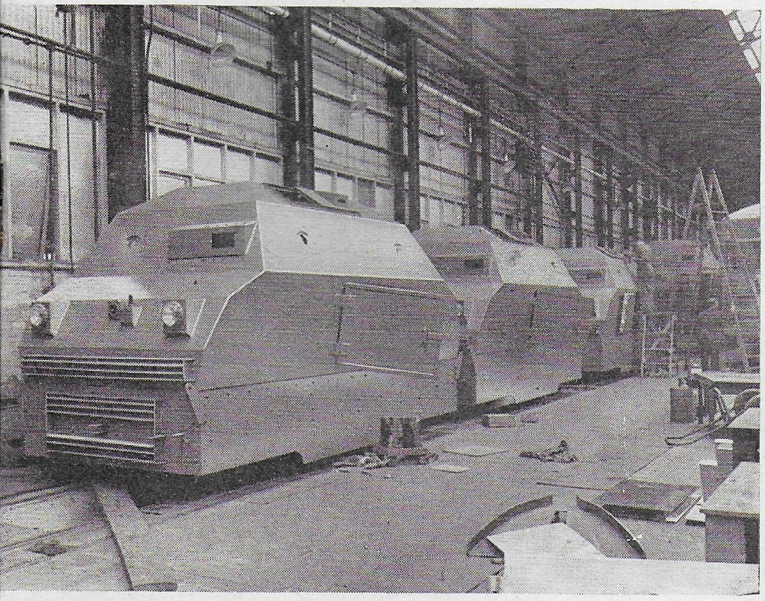


*Fig. 12. Chassis for armoured rail car shown in the foreground.*