

From 'GHOST' to 'FOX'

Jack Wheldon traces the
history of the armoured car

WHEN we see veteran cars of the 'nineties, we sometimes wonder at the hardiness of the pioneers who drove them along the rough, unmetalled roads of those days. Merely getting from one town to the next must have been high adventure. Yet it is a fact that long before motor cars had become either reliable or powerful, some daring spirits were trying to adapt them to warfare, by giving them guns and armour!

The U.S. Army claims to have been first in the field, with a group of cars designed by Col. R. D. Davidson of the North Western Military and Naval Academy in 1898. They were steamers, they carried a machine gun over the front wheels, but they were not really armoured. Just a few pieces of steel gave some protection to the machinery, but none to the crew, and for this reason we can't really accept that Col. Davidson built the first armoured car.

A more likely candidate was Fred Simms, the British engineer who introduced low-tension magneto ignition in 1899. In the same year he collaborated with Messrs. Vickers to produce a quadricycle protected all round by a boat-like steel hull having a pointed ram-nose. The top was open, and machine guns could be raised to fire over the 'gunwale'. Chain mail was hung to protect the tyres. Of course there were difficulties. Vision was inadequate, and the total weight of 6½ tons overburdened the little engine, which was geared down to a maximum of 9 m.p.h. Even so, remembering the primitive brakes of those days, one shudders to think of the Simms War Car going down a long, twisty, steep hill!

Now, this experiment was not taken seriously at the War Office, for two reasons. First, armies have to travel across country, and those early cars had no cross-country performance at all. Secondly, the W.O. had just experienced unpleasantness with an American sales-

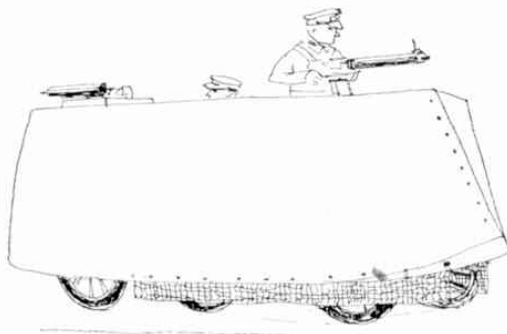
man named E. J. Pennington, who had tried to con them into buying a super-performance "Armoured Mobile Defence System". Pennington was simply trying to cash in on the motor-car boom. He had a strong line of sales talk about a patent "long-mingling spark" that was supposed to make even the tiniest of engines go like a tornado, and he claimed that his air-cooled cylinders of plain steel tubing were much better than the more expensive finned type! He also had a good line in coloured leaflets, and I suppose his aim was to collect as many advance payments as possible before disappearing. He nearly hooked the British Army—rumour had it that Lord Kitchener himself was very interested—but, fortunately, someone dug his toes in, and insisted on details and demonstrations. Pennington then disappeared, and his mysterious workshop was found to contain only a broken-down motor-bike and a lot of coloured pictures.

After these novelties, the armies of Europe and North America saw very few armoured cars for the next 14 years. A few wealthy car-owning officers experimented with steel plate and gun mountings, but the results were underpowered, liable to chassis breakage, and were helpless off the roads. Remember, a square foot of armour only 12 mm. thick weighs 20 lbs.

A new impetus came in 1914. The Royal Naval Air Service was operating inland from the French coast, and was losing too many pilots by forced-landings in German-held territory. So the Admiralty purchased 100 Rolls Royce Silver Ghost chassis, and had them fitted with coupe style armoured bodywork, which some people thought made the classic Rolls Royce lines even more handsome. These cars operated a "land-air rescue" service successfully until trench warfare set in.

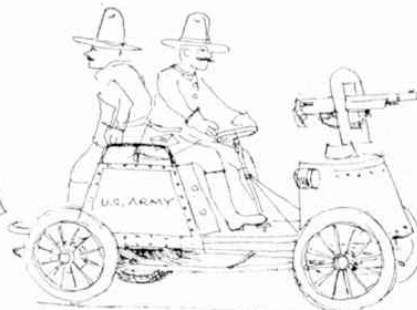
Now, the Silver Ghost chassis was strong, and the

SIMMS WAR CAR. 1899



Col. DAVIDSON'S "ARMoured" CAR

1898



Top photo shows the famous Rolls-Royce Silver Ghost armoured car of WW1. Note the coupe type body, radiator flaps in the open position, characteristic RR bonnet, and the bullet-proof jacket on the machine-gun. Weight was four tons and speed 60 m.p.h. Left, author's sketches of two 19th century fore-runners of the true armoured car.

Right, the prototype Straussler 4 × 4, the first modern production-made armoured car, built by Alvis to Manfred Weiss' design. Note rear engine and curved armour. Weight was 6 tons, speed nearly 70 m.p.h. Lower right, American armoured car of the '30s, built by Cunningham. Good quality and appearance but poor cross-country performance, outdated by the Weiss-Straussler-Alvis.

strong, reliable R.R. engine gave a good turn of speed even under the load of armour. Cross country performance was still poor—but the first difficulty, establishing reliability, had been overcome. As the cars could not cross trenches, new work was found for them in the dry, open country of the Middle East—and they excelled at long-range raids and reconnaissances under Lawrence of Arabia and the Duke of Westminster. They were excellent at police duties too, and so the Indian Army bought many cars for this purpose. They were given armour by various railway workshops. The Silver Ghost was always a favourite, and one of them, which acquired the interesting name of "Wedding Bells", lasted until 1940. Recently, the name has been bestowed again upon another Silver Ghost preserved at Boyington.

The fame of these desert exploits caused soldiers to think that armoured cars might again prove useful in Europe when trench warfare gave way to mobile warfare, and orders were given for cars to be built on Austin and Peerless small lorry chassis. Both cars had twin machine-gun turrets, and the Austin ran on pneumatic tyres, but the Peerless did a bone-shaking 18 m.p.h. on solid ones. How the gunners could take aim on the move, I can't imagine. The Tank Corps raised a Battalion (the 17th) to use these cars, and their chance arrived in the Autumn of 1918, when open warfare came at last. On November 11th they were operating far ahead, almost on the German frontier.

So the Armoured Car emerged from World War One as a converted luxury car or light lorry. Its reputation was high, based on successful police work, and on 'independent missions' in open warfare. But its future in this form was not assured, for it would soon prove vulnerable to the new anti-armour weapons—small mines and light anti-tank guns. If it was to survive, it would have to get off the road.

The British and other governments would not see this. They provided money only for new cars based on six-wheel lorry chassis. By doing this, they hoped to use the money in two directions at once:

- (a) giving the army 'post-war' equipment, and
- (b) helping the motor trade to develop something with commercial value.

This was a fatal error from the view of National Security, but British politicians were not the only ones who committed this folly. Poland actually purchased armoured cars built on the Ford Model T, and the Red Army's "Bronje Ford 27" was little better. The U.S. Government, by contrast, perhaps with an eye on the British Rolls-Royce Ghosts, thought that only the best would do, and ordered high-class and very elegant hardware built on La Salle and Cunningham chassis. All the same, their cross-country performance was close to zero.

The new thinking on the subject, so badly needed, came from Europe. First, in 1927 the Germany Army secretly ordered 3 experimental multi-wheel cars, two 8 wheelers and one 10 wheeler, although, of course, the Treaty of Versailles prohibited such vehicles. Money was short, so development was incomplete, and stopped in 1929. The technical problems of multi-wheel drive

Right, the 8 × 8 Boarhound built by General Motors, U.S.A., to British requirements, was in effect a wheeled tank. Redundant when "position war" evolved, but could it make a comeback?



and steering were great, but independent wheel suspension was achieved. Indeed, the 8-wheel car built by Germany in the late 'thirties was in some ways less sophisticated.

Just as the German army suspended research, an engineer in Hungary named Manfred Weiss took it up. The Weiss car was of monocoque construction: that is, the armoured hull required no chassis, and provided secure attachments for engine, drive and suspension. It had drive to all four wheels, and a system of swing links on the transverse leaf springs gave virtually independent suspension. At maximum wheel deflection, the hull remained level. The engine was at the rear, the car could be driven from either end, disengagement of front wheel drive and engagement of rear





Left, the 7-ton Daimler 4 × 4 of WWII with fluid flywheel and five pre-selector gears forward or reverse! Speed 50 m.p.h., armament 2 pdr. cannon with co-axial machine gun. Dinky Toy No. 670 represents this vehicle.

wheel steering was effected by one lever movement. Indeed, there were hosts of sound, workmanlike design-points. Frontal armour was sloped, top speed was 68 m.p.h., the power reserve was great, the vehicle climbed like a cat. . . . This machine, the first production-model cross-country armoured car, appeared in 1932. Weiss' problem was to get it on the market, and this was attempted by a friend, Nicholas Straussler, also a very gifted engineer, who was resident in England.

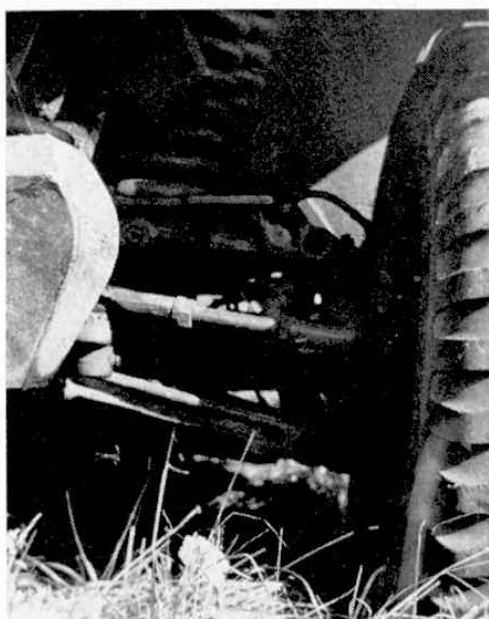
To cut a long story short, they never really got it off the ground. 'Straussler' cars were used in small numbers by the R.A.F., the Dutch Colonial Forces, Hungary, and Germany. The chief difficulty lay in getting volume production organised. In England, for example, Straussler teamed up with Alvis Ltd., but the chairman of Alvis had just decided that the future of Alvis lay with the aircraft industry, and armoured cars were a sideline. Each car thus took about a month to build.

From 1932 to the eve of World War Two, the Alvis-Straussler was the most advanced 'second generation' armoured car in the world. Then, the nations about to plunge into conflict suddenly saw its advantages—and began to copy its features and improve on them. There were the 4 × 4 Auto-Union, the 8 × 8 Bussing-NAG, the 4 × 4 Guy, 4 × 4 Daimler, 4 × 4 Humber (actually built by Karrier) on the basis of the Guy, and in the U.S.A. the big car building firms were commencing research, although the U.S. Army itself showed small interest in armoured cars. The Ford 6 × 6 'Greyhound' and Chevrolet 4 × 4 'Staghound' were produced to British requirements. All these eve-of-war cars were armed

with cannon, and had the latest equipment. Weiss' design suffered from having been first in the field, and played no important part in the war, although its features were to be seen everywhere.

Alongside these high-performance fighting reconnaissance cars, a family of smaller, lighter, 'scout cars' grew up, some turretless, others with small open-topped machine gun turrets. Such were the little Daimler (which took over the nickname "Dingo" from a similar vehicle from Alvis), the Humber Light Recce, the Horch, and the Russian BA 64.

Now, speed was very important to these new generation cars, and they needed pneumatic tyres. But the latter are not bullet proof, and armoured skirts are heavy, and catch on obstacles. The answer was the 'Runflat' tyre; an outer pneumatic case and tube, with an inner solid rubber tyre. The runflat allows a multi-wheel



Independent front wheel suspension of a Daimler A.C. Note coil springs and wishbones. Used on armoured cars long before their use in sports cars etc.

drive vehicle to keep belting along under control even after unkind people have shot holes in the tyres.

The German Bussing-NAG 8-wheeler was much admired in the mid-war period and both the G.M.C. 'Boarhound' and the Marmon-Herrington Mark 6 were built in emulation of it. This desire for really big armoured cars showed that high cross country performance and the ability to carry a cannon were creating the possibility of a wheeled tank. A big 8-wheeler weighed 24 tons and carried a 57 mm. cannon. It was in the 1942 medium tank class! If it could be developed, it would offer the immense advantages of long range, longer life between overhauls, fuel economy, silence, speed. And had the mobile war of the early 'forties continued, who knows what might have happened? But after 1942 the trend was towards 'position war', which demanded ever thicker armour, and immense guns, requirements which could not be met by the



Left, British Scout Car, WWII, built by Humber, seen from the rear. Angled hull for maximum protection, open top (no turret) and rear engine.

Right, notice how the front four wheels of the 6 × 6 Saladin turn to different angles for correct geometry in tight manoeuvres.

development of 'Boarhound' types. It was easier to develop tank types. Thus, by 1945 battle tanks were weighing around 50 tons, but armoured cars had levelled out at around 11 tons, and 'Boarhound' types had been dropped. The typical cars of 1945 were the 11 ton A.E.C., the 'Coventry' (a heavier Daimler) and the 'Staghound'. They were armed with 75 mm. guns (tanks were up to 90 mm.), and their armour situation was confused. It was excessively thick for 'bullets and splinters', yet far too thin to keep out any modern anti-tank projectile.

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Both Britain and France produced new armoured cars for the fifties, and both elected to remain in the 11 ton class. Britain produced the 6 × 6 Alvis Saladin, of conventional layout, armed with a 7.62 mm. gun, capable of 50 m.p.h. on the level, but somewhat under-powered and slow on the hills, and advertising its whereabouts with a penetrating whine which can be heard for miles. The purpose of the big gun was to give it a chance of dealing with tanks, as well as versatility in actions against bandit-type opponents. France produced an 8 wheeler, the EBR 75, with a similar gun and



Scout car development; two versions of the Ferret, one with small open machine-gun turret, the other with anti-tank missile pack.

moderate mobility performance, but with a very neat, low silhouette. The hull is symmetrical, and occupied by crew at both ends, and the engine, a compact unit only 9 in. high, is tucked away under the floor, where it annoys the fitters who have to maintain it. By contrast, the U.S.A. and U.S.S.R. have paid small attention to armoured cars, so the Saladin and EBR. 75 have soldiered on as 'modern' cars for nearly 20 years, and only now is the scene changing again, and 'third generation' cars appearing.

But only, it seems, for Britain. Other countries seem still to be looking to the past. Thus, in the U.S.A. Lockheed are developing their 8-wheeled 'Twister', which undoubtedly has a fantastic obstacle-crossing performance, with walking-beam rear bogie and what-not. But this is at the price of an excessively large vehicle, 10 tons of weight in pre-combat format, a dreadfully complex transmission system, and 3 million dollars. Power relative to weight is actually not very wonderful, and so far it is not amphibious. The Army of West Germany likewise is developing a big 8-wheeler, very reminiscent of World War 2, and very heavy. Its 16 tons soon soak up its 400 b.h.p. It is amphibious, with duplex drive to a built-in water propeller.

The best 11-tonner of its time, the Saladin demonstrates agility at an RAC show in 1964. It has just crossed a 4½ ft gap with scarcely a bump.



In Britain, by contrast, it was decided that as the main roles of the armoured car are reconnaissance, observation and liaison work, it is unwise to pile battle tank characteristics on to it. The recon vehicle's best protection, and usefulness, come from concealment and super-mobility. So the Fighting Vehicle Research and Development Establishment and Daimler Ltd., have produced the 'Fox', which weighs only 5½ tons, is only 6½ feet high, churns out 34 b.h.p. per ton, and can motor really fast. Its main armament is the lightweight 30 mm. Rarden cannon, having a very high performance with all types of ammunition. As the inboard length of the gun is very short, it can be elevated enough to engage low-speed aircraft. Its AP ammunition deals with any light AFV, and soon a special round will do the same to heavy armour. The importance of a high-performance ammunition in the small calibre of 30 mm. cannot be exaggerated; little 'Fox' can stow 96 cannon rounds, 2,600 machine gun rounds, and 2 salvos of smoke, plus personal weapons. In addition, a guided missile pack can be mounted on the turret.

Reconnaissance means navigation plus surveillance plus communications. So 'Fox' has day and night optical aids, a Sperry Navigator, nuclear and bacteriological detection and protection systems, radar—very important for plotting enemy fire positions—and a choice of radio equipment. And the thermally insulated interior has been carefully designed to permit one-man control of all systems, for crew comfort is of vital importance in long-range AFVs. Excesses of heat and





Britain's newest armoured car, Fox, small in size but big in performance, is quiet and unobtrusive but packs quite a wallop. Only 5½ tons, it is capable of well over 60 m.p.h.

cold, and awkward equipment, can tire a crew and lower their efficiency.

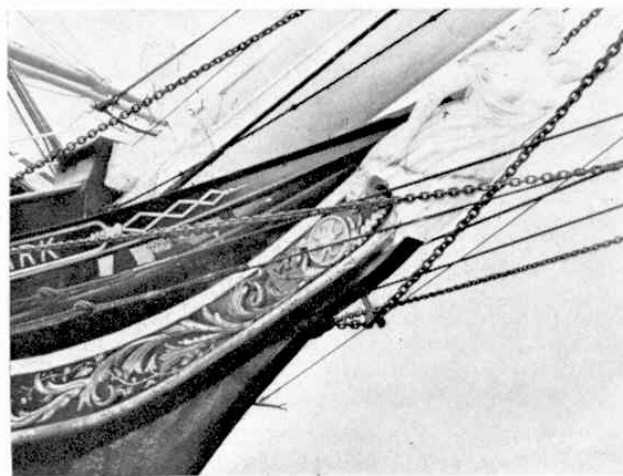
That all this comes in a neat 3-man package weighing only 5½ tons is due to the combined research of Daimler Ltd. and High Duty Alloys Ltd. For 'Fox' is made of—wait for it—the same material that Dinky Toys are made of; the light alloy Mazak. No wonder Dinky Toys will stand a lot of bashing about from their younger owners! But of course Dinky Toys are not expected to be bullet proof, and this is where the research came in. Careful adjustment of chemical balance and heat treatment have given Fox's hull and turret better protection against bullets and splinters than the equivalent weight

of steel, and, as this special alloy can be welded, Fox's designers have given its outside a subtle, missile-deflecting mixture of angles and curves. Of course, it is not expected to keep out heavy anti-tank missiles; that is where speed and concealment come in.

But where does the high engine performance come from, when the engine compartment is so small. The answer is—racing competition. The motor is the 4 litre Jaguar XK. Coming through Bovington the other day I saw an armoured car pull on to the road ahead of me. At first glance I thought it was a Ferret with turret equipment, and expected to overtake. To my surprise, it suddenly shot off down the road like a, well, like a Jaguar in a hurry, leaving my Austin 1100 standing. Needless to say, it was a Fox. And Fox can be driven equally fast in reverse!

Anything more? Well, a flotation kit can be clipped on in seconds. Two Foxes can be carried on a Hercules, and both can be parachuted from it. Suspension is independent, with wheel deflection of 11 inches. Brakes are servo caliper disc, and wading doesn't affect them.

Yes, armoured cars have come a long way, and Fox has come furthest of all. Just think what it carries and what it can do, and then think—it weighs only 1 ton more than the improved Silver Ghost of 1920. We can surely congratulate its designers and builders on their achievement.



The Story of

By A. P. Major

SHIPS' FIGUREHEADS

THE first men who ventured on the seas with their primitive craft believed the water contained a male spirit which could protect or destroy them. To please "him" a young girl used to be sacrificed before a voyage and her head placed on a pole in the bows. Later carved figures in the shape of gods and symbolic creatures were fixed on the bows and were meant to frighten enemies. Another purpose in the days of oared galleys was to use the solid carving as above-water rams. When driven with force against an enemy ship they could make it heel over. From these beginnings was developed the figurehead.

The war galleys of ancient Greece and Rome had the ram fashioned as the head of a charging beast, a ram, boar, even an elephant. The peaceful Phoenician traders symbolised their ship as a swift horse, using a carved horse's head and neck. The Northmen of the

Middle Ages likened the heads to those of snakes and dragons. In the 11th century Danish raiders had figures of lions, bulls, dolphins, etc. Sweyn's ship of 1004 had the head of a dragon as the figurehead while the stern post was carved as its tail. William the Conqueror's personal ship had a lion's head on the bows while at the stern there was a figure of a boy blowing a trumpet and pointing with an outstretched hand. Henry V's ship *Holigost* had two of the royal devices, a carving of a swan and antelope. Three of Elizabeth I's ships were the *Mary Rose* with a unicorn, *Swiftsure* with a tiger and *Repulse* a lion figurehead. During the Stuart period St George alone or slaying a dragon was popular. After the Restoration of Charles II figureheads on both naval and merchant ships became very intricately carved and elaborate. The *St. Michael* of 1669 showed Jupiter in a chariot being drawn by a two-headed eagle. The *Royal Anne* of 1704 had an ox, a woman and several Cupids on each side of a large carved shield of the Royal Arms, the latter supported by four Cupids while two female figures and more Cupids were carved underneath. The original figurehead of Nelson's *Victory* in 1765 had several dozen figures and animals upon it, but in the ship's overhaul in 1802-3 this was changed to a simple "device" of the crowned Royal Arms with a pair of Cupids, legs standing on both feet, as supporters. Incidentally, the figurehead on the *Victory* today is not the one which saw battle at Trafalgar. In 1814-15 the *Victory* was given a new figurehead very similar to the other mentioned, except the Cupids have their legs crossed.

The cost of carving these intricate figureheads was so high that in August, 1796, the Board of Admiralty