PROFILE

AFV WEAPONS 35

British Armoured Recovery Vehicles + Wheels, Tracks & Transporters

by Peter Chamberlain and Major-General N. W. Duncan

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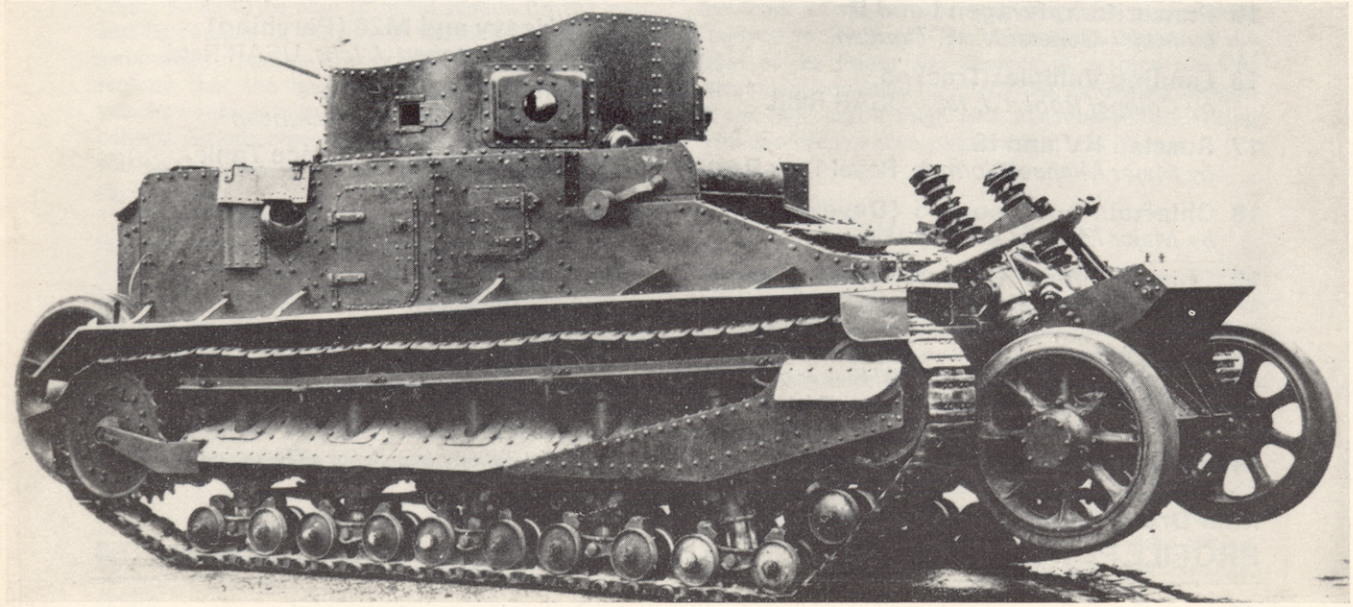

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Sherman Beach Armoured Recovery Vehicle towing a truck ashore in Normandy, June 1944. (Photo: Imperial War Museum)

Armoured Recovery Vehicles

by Peter Chamberlain

BY 1942 it was recognized by the War Office that there was an urgent requirement for a tracked recovery vehicle, able to operate over the same terrain as the combat tanks and having the same tractive power to retrieve the dead tank by dragging or towing it to a point where the casualty could be loaded on to a wheeled transport and taken to a base workshop. The recovery vehicle should also be able to carry personnel, spare assemblies, repair equipment and a light jib crane, so as to be able to make repairs on the spot, and be capable of moving at the same speed as the armoured formation to which it was attached. It was realised that the basis for this type of specialised vehicle would be a tank and it was at first planned to convert various types of tanks then in service to this rôle so that they could operate with similar types of combat tanks.

Armoured recovery vehicles based on the Covenanter, Crusader, Grant and Churchill were built and tested by R.E.M.E. at Arborfield during February 1942. As a result it was decided to concentrate on the Churchill as a basic chassis for conversion to the ARV rôle because of its general characteristics and because it was becoming available in adequate numbers. Later, however, models of the Cavalier, Centaur and Cromwell ARV I were also produced. There were also Canadian Ram ARVs Mk. I and Mk. II.

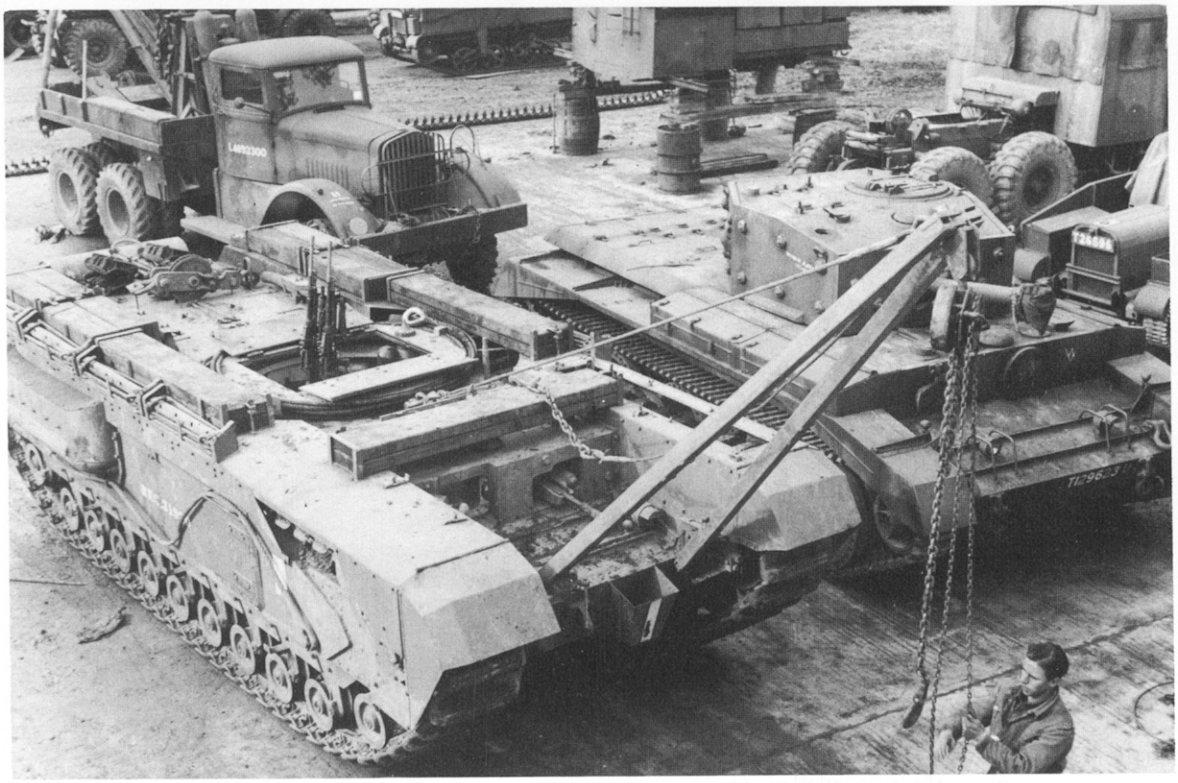
CHURCHILL ARV I

This consisted of a Churchill IV with the turret and armament removed and a flat hinged lid substituted. A portable jib crane with the lifting capacity of five tons was fitted so that it could be easily erected, and gas cutting and welding equipment with tools and repair equipment was stowed in the hull. A crew of three was carried including the driver. The ARV Mk. I was primarily an armoured tug having a drawbar connector fitted at the rear. The jib booms were carried on the sides and when required they were mounted on the front of the vehicle and raised by a wire rope clamped to the track. The chain block carried at the head of the boom was capable of a three ton lift. Armament consisted of a 7·92-mm. Besa machine-gun in the hull, and a Pugh twin machine-gun mounting with two Bren or Sten guns. Weight was 33 tons.

SHERMAN ARV I

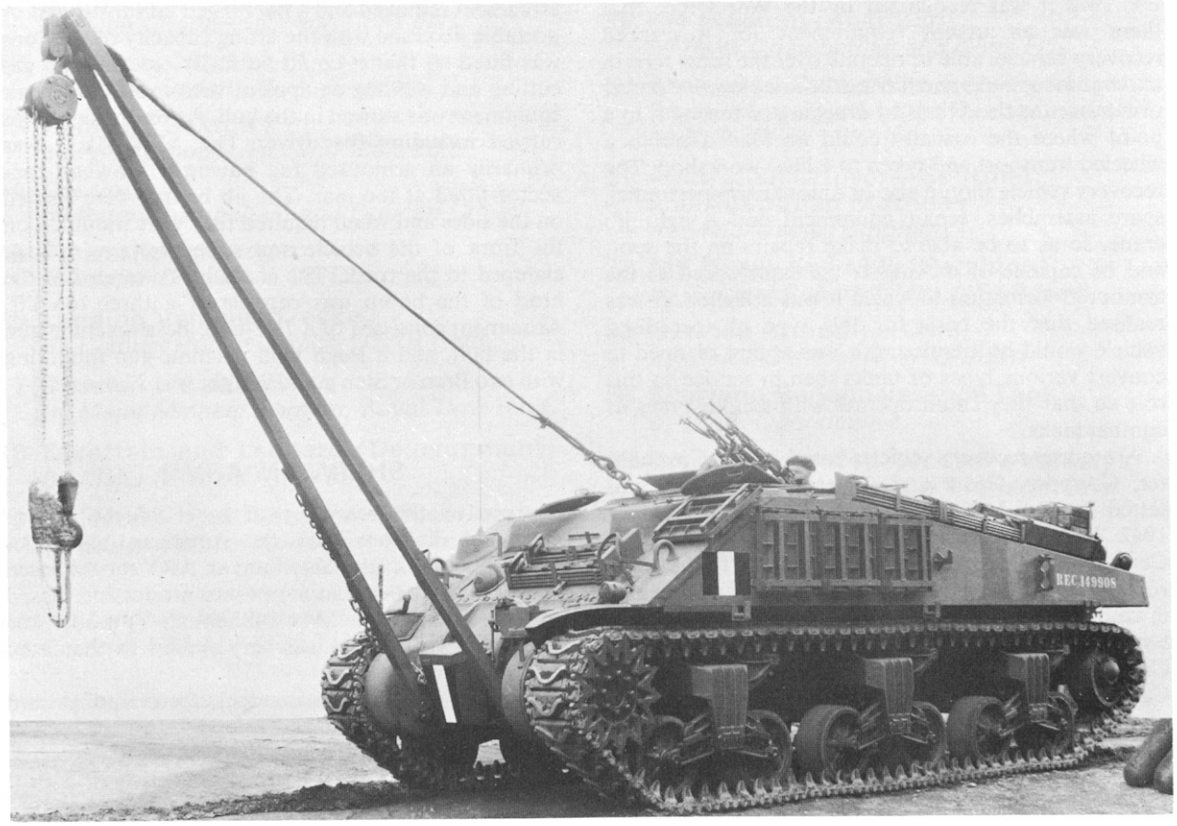
Because of the rearming of most of the British armoured divisions with the American M4 series of Medium tank (the Sherman) an ARV model based on this tank was very soon put into production. Based on the chassis of the M4A4 (Sherman V) model, the conversion equipment was very similar to that used on the Churchill ARV I.

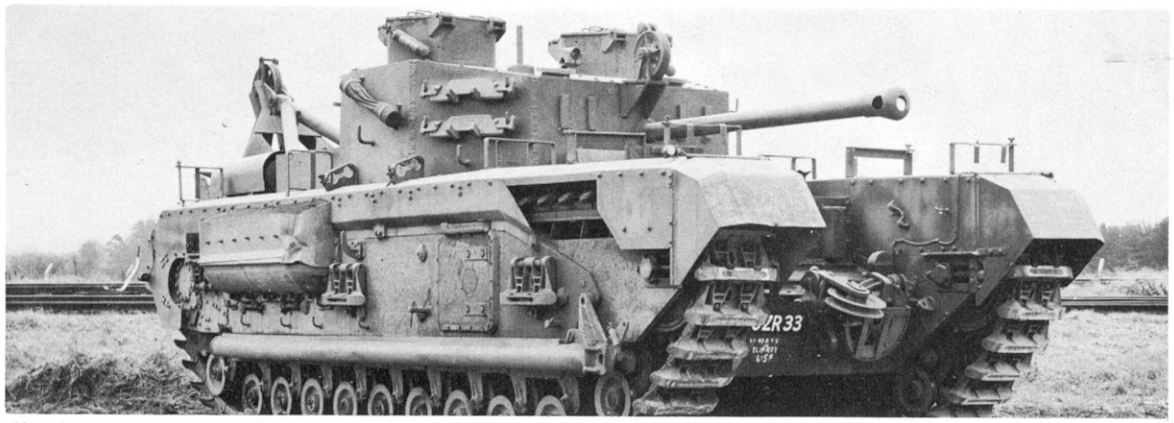
The original turret, armament, turret fittings and stowage were removed and internal stowage revised and re-positioned. The hull roof plate opening, formerly occupied by the turret, was covered with a circular section of armour having two large hatches.



Churchill ARV Mk. I with front jib erected. Note the armament—7·92 mm. Besa machine-gun in the hull and twin Brens.
(Photo: Imperial War Museum)

Sherman ARV I with front jib erected and twin Brens. Note position of wireless aerials. (Photo: Imperial War Museum)





Churchill ARV II with front jib stowed. Note fixed turret, fixed rear jib, and dummy 6-pdr. gun. (Photo: Imperial War Museum)

GRANT AND RAM ARV I AND II

The Grant ARV I was a British conversion equipped to the same standards as other British Mark I ARVs. The Grant ARV II was the British designation for the standard U.S. M31 TRV in British service. The Australians produced their own special ARV in 1944 by removing the guns from a standard Grant and installing a winch in the fighting compartment with a roller guide erected on the rear hull to give the winch purchase. Tool boxes were also added to the hull rear, as well as an earth spade.

The Canadians converted some of their Rams to the recovery rôle. The Ram ARV Mark I was a towing vehicle only with a winch on the hull front and tool boxes on the rear hull decking. The Mark II was more sophisticated and was equipped to the British Mark II ARV standard: dummy fixed turret and dummy gun, rear jib, earth spade, and electric winch.

CRUISER CHASSIS ARVs

The Covenanter and Crusader ARVs had a similar appearance. The turret was removed from a standard vehicle and it was fitted with a dismountable A-frame jib crane together with tools and equipment for front line repairs and recovery. Twin Bren A.A. machine-guns could be mounted in the former fighting compartment.

The Cavalier, Centaur, and Cromwell ARVs were also similar to each other in appearance. The turret was removed, though the forward hull machine-gun was retained, and twin Brens were mounted, as in the Crusader, for A.A. defence. The ARV had standard recovery vehicle equipment: dismountable jib crane, winch, drawbars, and detachable track grousers.
The wireless set and aerials were re-positioned. The vehicle was fitted with a special type of track grouser when operating on soft ground. A 4½-in. vice was fitted to a curved slotted bracket welded to the front of the vehicle.

CHURCHILL ARV II

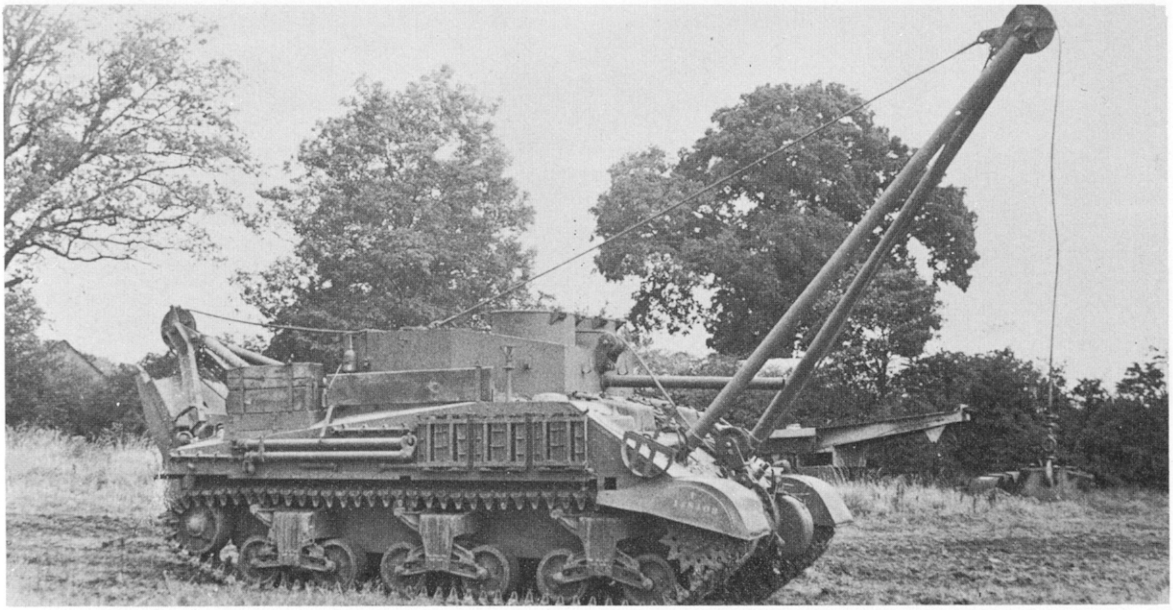
As the ARV I could only operate as a direct tractor and, when recovering heavy loads, had to work in conjunction with another AFV and a system of holdfasts, service use in the field had shown that there was a need for a more powerful winch gear and some form of earth anchor. Development of a vehicle to this requirement was again undertaken by R.E.M.E. who made a pilot model, production vehicles being ready for issue by early 1944; conversions were produced on both Churchill and Sherman chassis.

The Churchill ARV Mk. II was based on the Churchill Mk. III and Mk. IV chassis, the standard turret being replaced by a fixed turret fabricated from 40-mm. armoured plate welded to the roof of the vehicle, with a turret roof of 14-mm. plate carrying two cupolas. A dummy 6-pdr. gun was mounted.

The special equipment carried consisted of a dismountable forward or front jib capable of supporting a 7½ ton load, a fixed rear jib for lifting or giving a combined lift and haul of 15 tons, and a two-speed winch driven from the engine capable of developing a direct pull of 25 tons through the winch rope which passed from a drum through a rectangular opening in the rear plate of the turret with suitable guide rollers. A spade-type earth anchor was hinged at the rear of the vehicle to prevent rearward movement of the vehicle, when the winch pull exceeded the tractive resistance of the AFV. Miscellaneous equipment and tools including 25 ton snatch blocks shackles, tow ropes, and gas welding equipment was carried for the crew of four. Weight of the vehicle was 40·1 tons. Armament consisted of one 7·92-mm. Besa in the hull and one Bren gun.

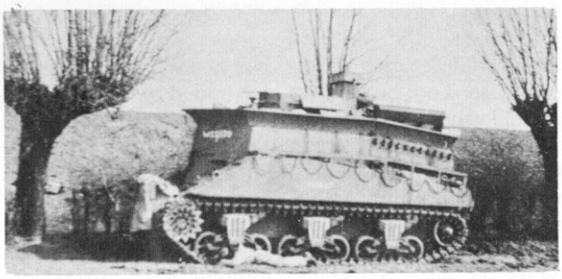
SHERMAN ARV II

Based on the Sherman V (Medium M4A4) chassis, the conversion was similar to that of the Churchill ARV II. The turret (a welded structure of armour plate) was welded in a fixed position on the hull roof plate and fitted with a dummy gun. On the turret roof was fitted two cupolas, each with a roof hatch covering nearly the whole area of the cupola roof. The special equipment carried consisted of a dismantled front jib capable of lifting a weight of 7½ tons at the height of approximately 17 ft. from the ground, a rear fixed jib for lifting or giving a combined lift and direct pull, and a two-speed winch driven from the engine capable of developing a direct pull of 25 tons. A spade type earth anchor was hinged at the rear. Miscellaneous equip-



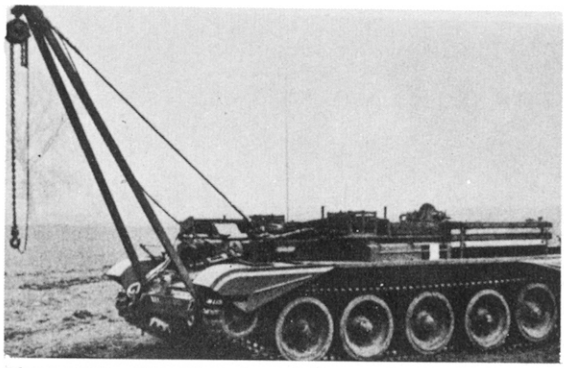
Sherman ARV II with front jib erected. The conversion is similar to the Churchill ARV II—fixed turret, fixed rear jib, and dummy gun. The spade type earth anchor in raised position can be seen at rear. (Photo: Imperial War Museum)

Grant ARV Mark I.

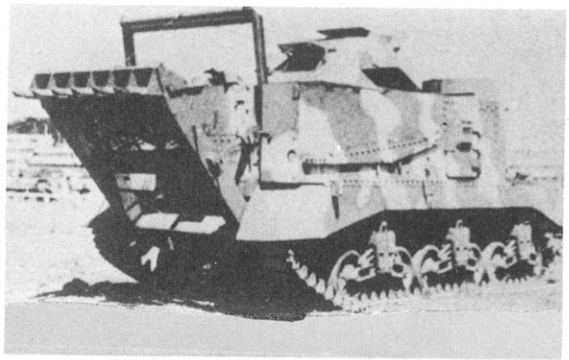


Sherman Beach Armoured Recovery Vehicle waiting for a call on its services at the Rhine crossings in March 1945. (Photo: Major-General N. W. Duncan)

Knocked out flail tanks (Sherman Crabs) of 1st Lothians and Border Horse, 30 Armoured Brigade, 79th Armoured Division, being recovered by Sherman ARV Is after the attack on Le Havre, September 1944. (Photo: Major-General N. W. Duncan)



Three quarter left front view of Centaur ARV. Cavalier and Cromwell ARVs were similar in appearance.



Three quarter right rear view of the Australian Grant ARV Mark II, showing earth spade and roller guide.

ment and stores carried included 25 ton snatch block, shackles, tow ropes and gas welding equipment.

BEACH ARMOURED RECOVERY VEHICLES (BARV)

This was another form of recovery vehicle that was developed during 1943 to recover disabled vehicles from the beaches during the forthcoming landings in France.

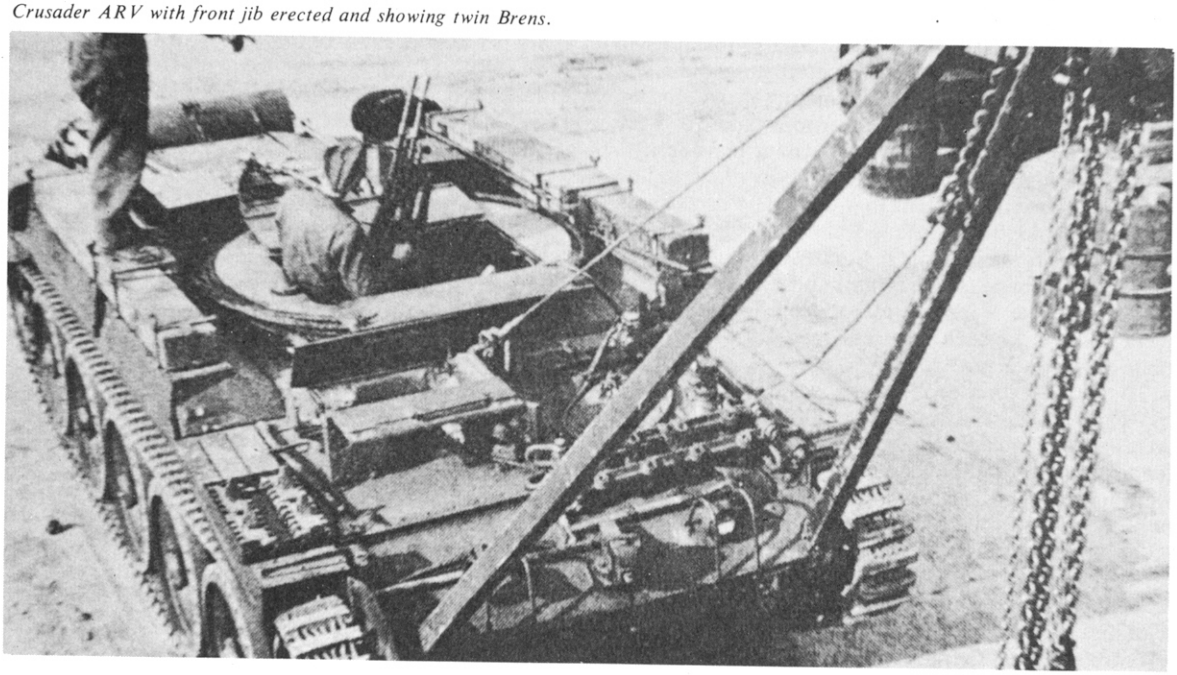
Early experiments were carried out by R.E.M.E. who developed a trials vehicle based on the Churchill ARV I. Further tests were made with turretless waterproofed Churchill and Sherman tanks fitted with fixed fabricated box-type structures and wading equipment. Trials with these vehicles provided valuable experience which led to the choice of the Sherman tank with an all-welded hull.

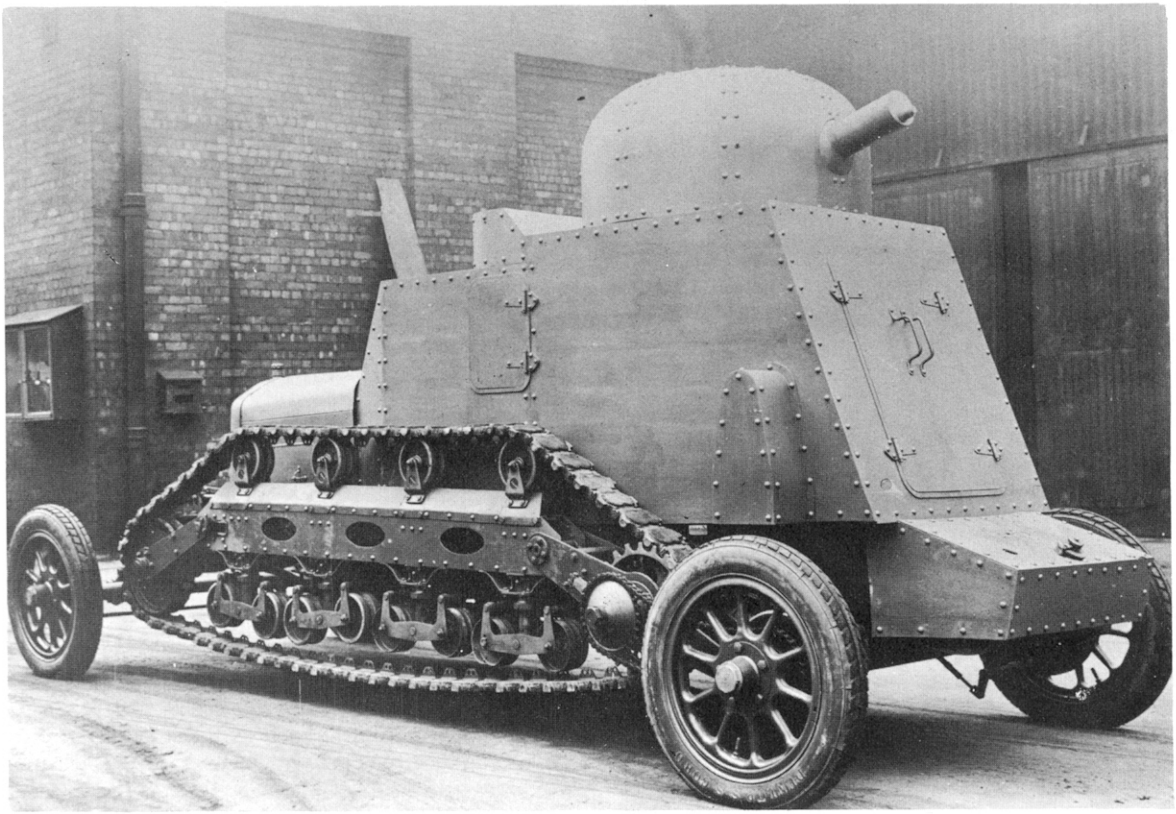
The design of a BARV based on an M4A3 (Sherman IVA) was commenced in November 1943. Fitted with a welded armoured top superstructure and various modifications that included an internal structural design air intake to the crew and a bilge pump to eliminate any water intake, the vehicle proved capable of operating in water to a depth of nine feet with an 18 in. surge.

Because of the urgency of getting these vehicles into production by D-Day it was impossible to devote time to further development such as the installation of a winch and the fitting of earth anchors. The vehicle was therefore limited to straight pulls.

A requirement for 50 BARVs was placed, this being later raised to 66. By D-Day 52 vehicles were completed and delivered to Beach Recovery Section, production vehicles being based on the diesel-engined M4A2 (Sherman III).

Crusader ARV with front jib erected and showing twin Brens.





Three-quarter rear view of Vickers Wolseley wheel-cum-track armoured car. Chain drive to rear wheels and casing for jacks to raise rear wheels can be seen. (Photo: Vickers Ltd.)

Wheels, Tracks and Transporters

by Major-General N. W. Duncan

TRACK wear raised its ugly head as a problem when Mother and Little Willie were completing their first trials and it has remained a major worry to the commanders of all armoured troops and to AFV designers ever since. Fifty miles was a considerable distance for the Mark I track and by then it had stretched to such an extent that continued use was no longer possible: the lengthened links no longer engaged properly with the driving sprocket whose teeth wore into hooked shape (see diagram) and ultimately broke off, or else the track plates rode over the sprocket teeth setting up such stresses that either the track plate or the track pin broke.

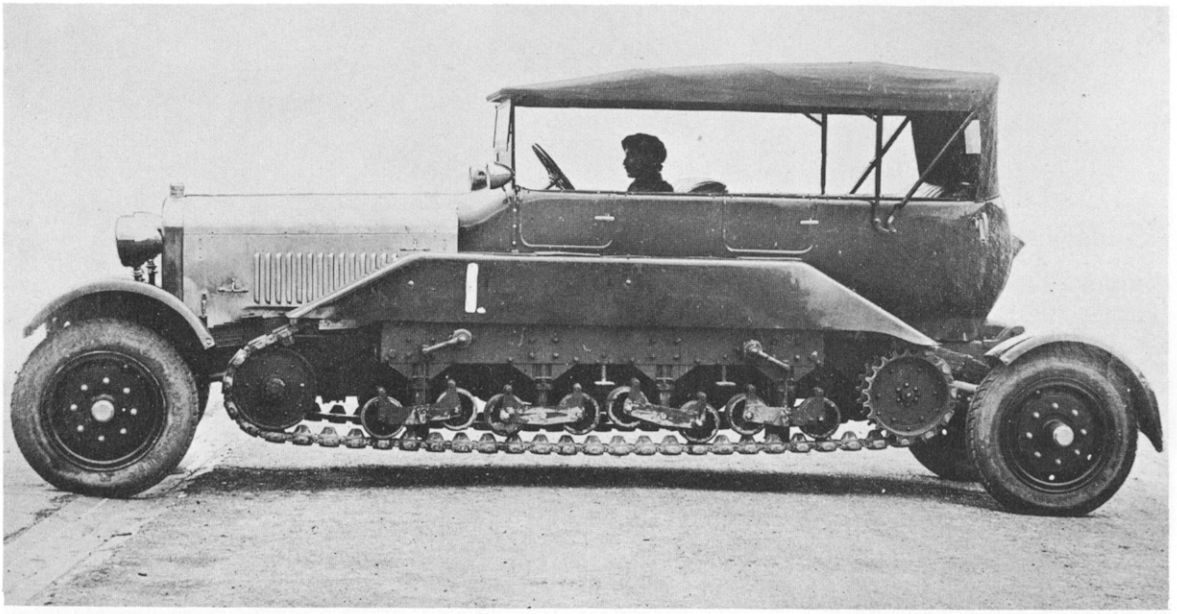
To get over this problem as far as possible tank movement was carried out by train. Special wagons were required to take the load and to keep within the loading gauge. Although a necessary evil rail moves were not popular with tank crews who in early days had to remove the sponsons and mount them on sponson trucks to reduce the overall width of the tank on the wagons. Matters improved with the Mark IV whose sponsons could be swung inboard but even then a lot of work was involved.

Entraining and detraining was taught as a drill and every permanent camp of the Tank Corps had dummy tank wagons constructed of concrete on which practice could be carried out. Dummy ramps to ground level simulated conditions which would obtain when tanks could not be unloaded at a station's unloading dock.

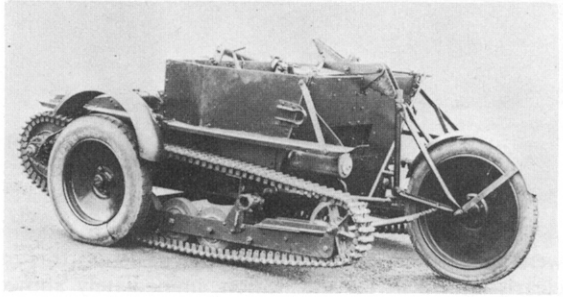
The same problem occurred after Dunkirk in 1940 when the rapid movement of armour in the United Kingdom was imperative. Special wagons and portable ramps were built but their use was limited and they were ultimately replaced by the wheeled road tank transporter which had become a feasible proposition with the manufacture of heavy duty pneumatic tyres.

After World War I various attempts were made to produce a lubricated track which would keep at bay the abrasive mixture of dirt, sand and mud which played such havoc with the ordinary tracks. They failed because of the difficulty of devising satisfactory oil seals, the high cost of manufacture, and the amount of skilled labour involved in their production: track wear remained apparently insoluble and it was not until the Vickers Medium tanks had come into service that a new approach was made to the problem.

In 1926 Vickers modified a Wolseley car chassis to

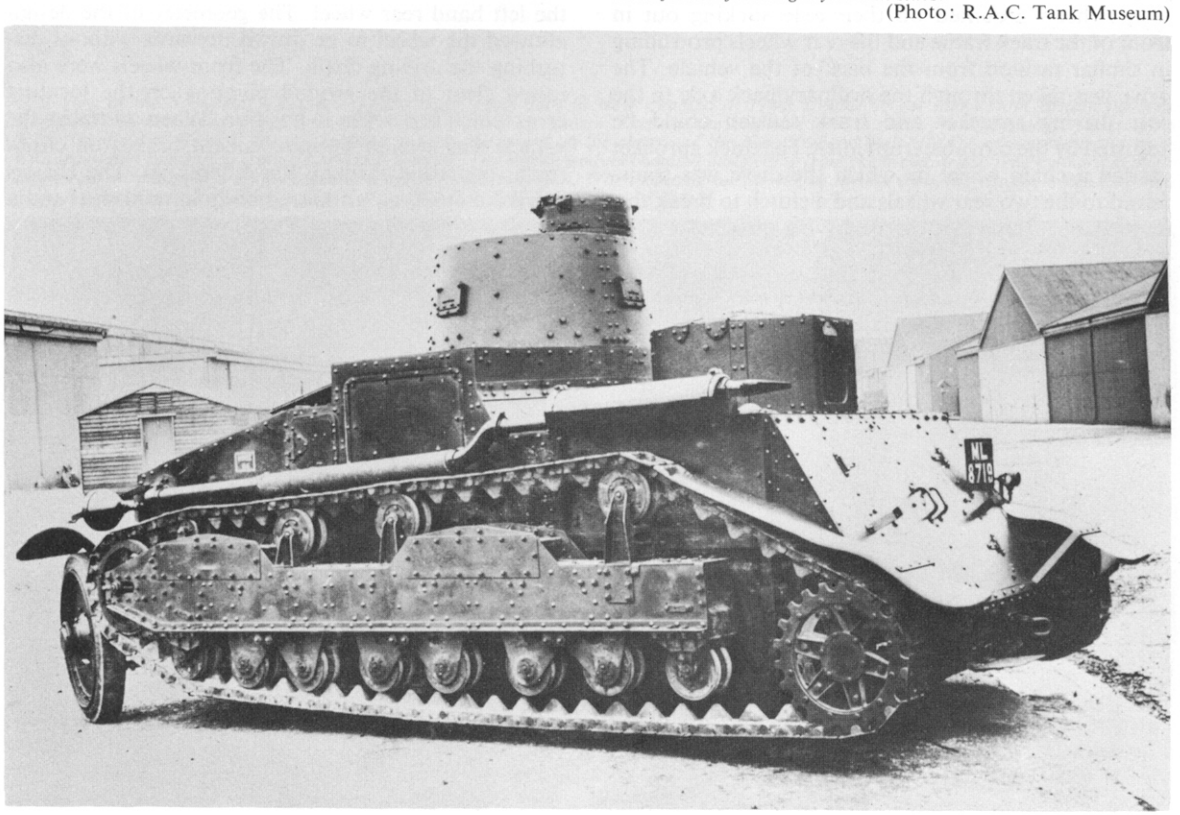


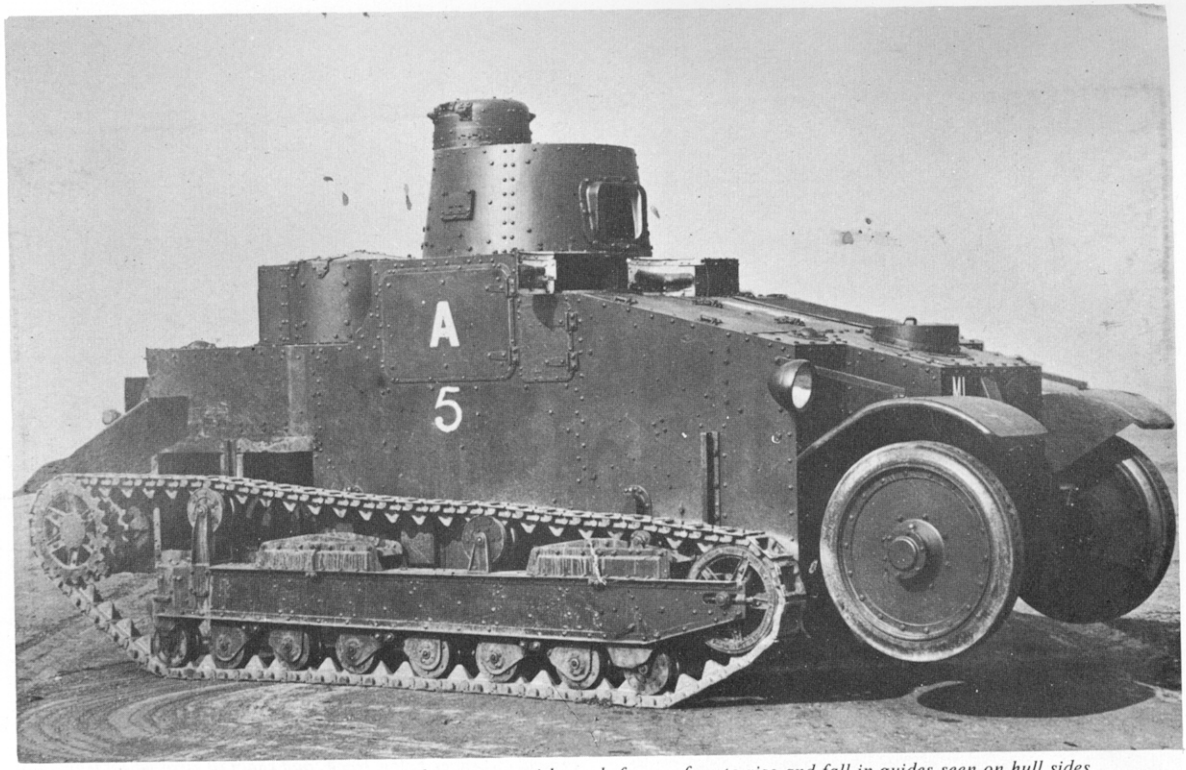
The later version of the Vickers Wolseley wheel-cum-track car.
(Photo: R.A.C. Tank Museum)



Carden-Loyd carrier Mark V shown on wheels. Note small ground clearance below track, and chain to pivot wheel frame for steering. Clearance below mudguards shows how far wheels lift for tracked drive. (Photo: R.A.C. Tank Museum)

Vickers Wheel-cum-Track Tank, 1928. First prototype with track frames fixed rigidly to hull sides.
(Photo: R.A.C. Tank Museum)



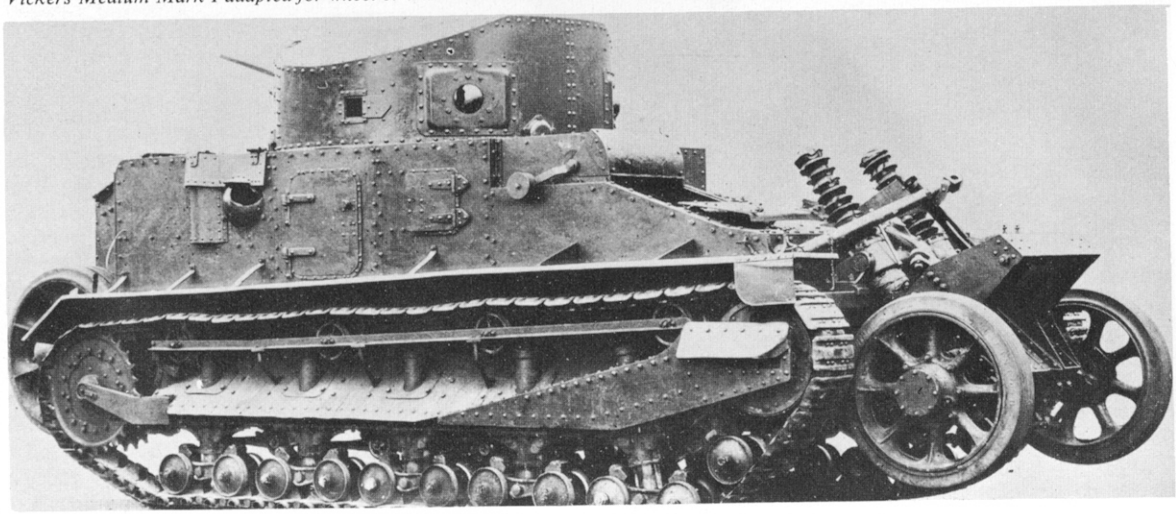


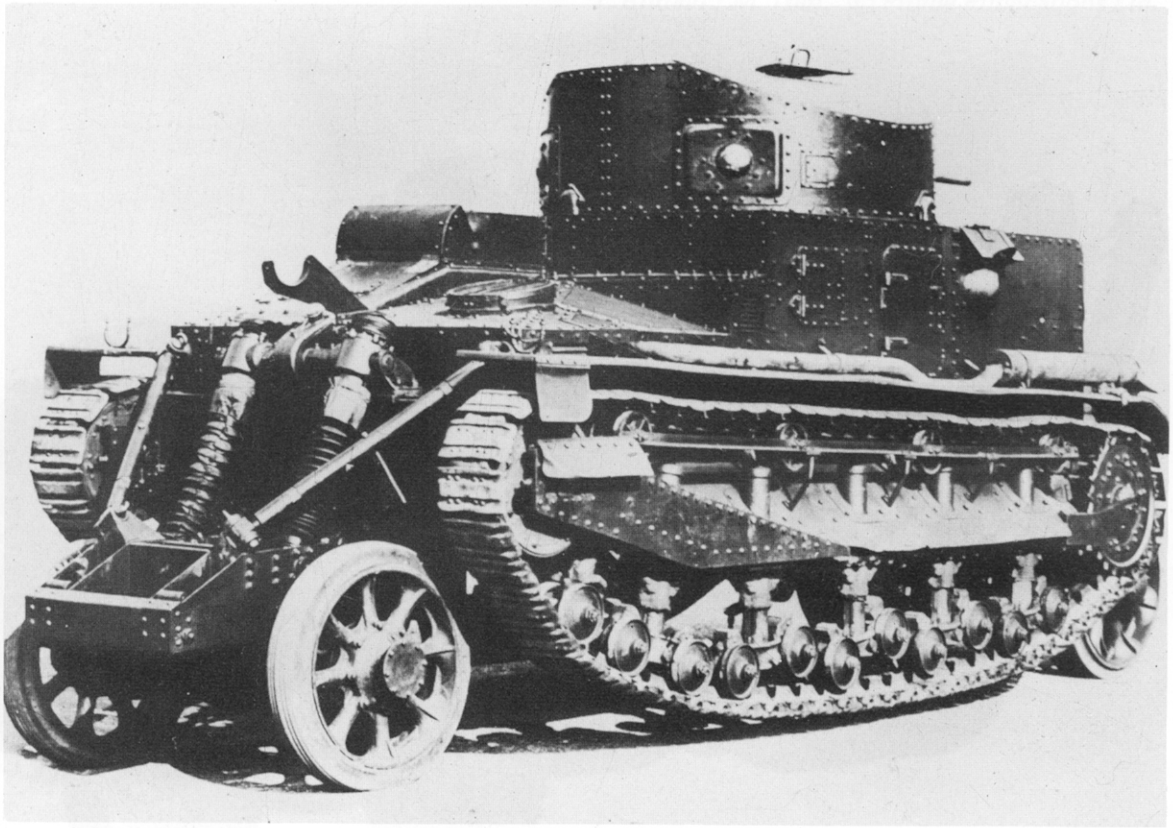
Vickers Wheel-cum-Track Tank, 1928. Second prototype with track frames free to rise and fall in guides seen on hull sides. (Photo: R.A.C. Tank Museum)

run on tracks or wheels at will. A track frame, based on that of the Medium tank but with better bogies, was attached to the chassis on either side, with the ordinary front wheels mounted on their axle sticking out in front of the track frame and the rear wheels protruding in similar fashion from the back of the vehicle. The drive was taken through the ordinary back axle to the rear driving sprocket and track tension could be adjusted by the movable front idler. The track sprocket carried a chain wheel by which the drive was transferred to the two rear wheels and a clutch to break this drive was also provided on the driving sprocket.

To change over to tracked drive the rear wheels were raised—the housing for the jacks to do this is clearly shown in the illustration, immediately above the left hand rear wheel. The geometry of the design allowed the wheel to be drawn upwards without disturbing the driving chain. The front wheels were also raised clear of the ground pivoting on the locating arms which kept them in position. When on tracks the vehicle was steered by independent brakes on either track, operating through the differential. The chassis carried a mock-up armoured body in mild steel and a rotating turret similar to those on the Indian pattern

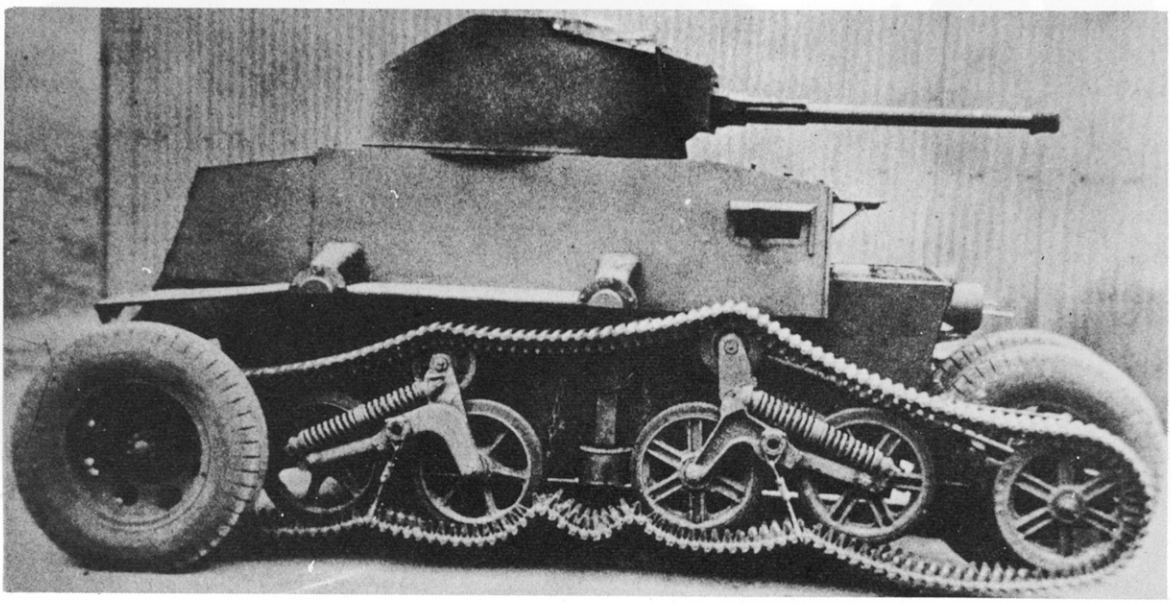
Vickers Medium Mark I adapted for wheel or track movement shown on tracks with wheels raised. (Photo: Imperial War Museum)

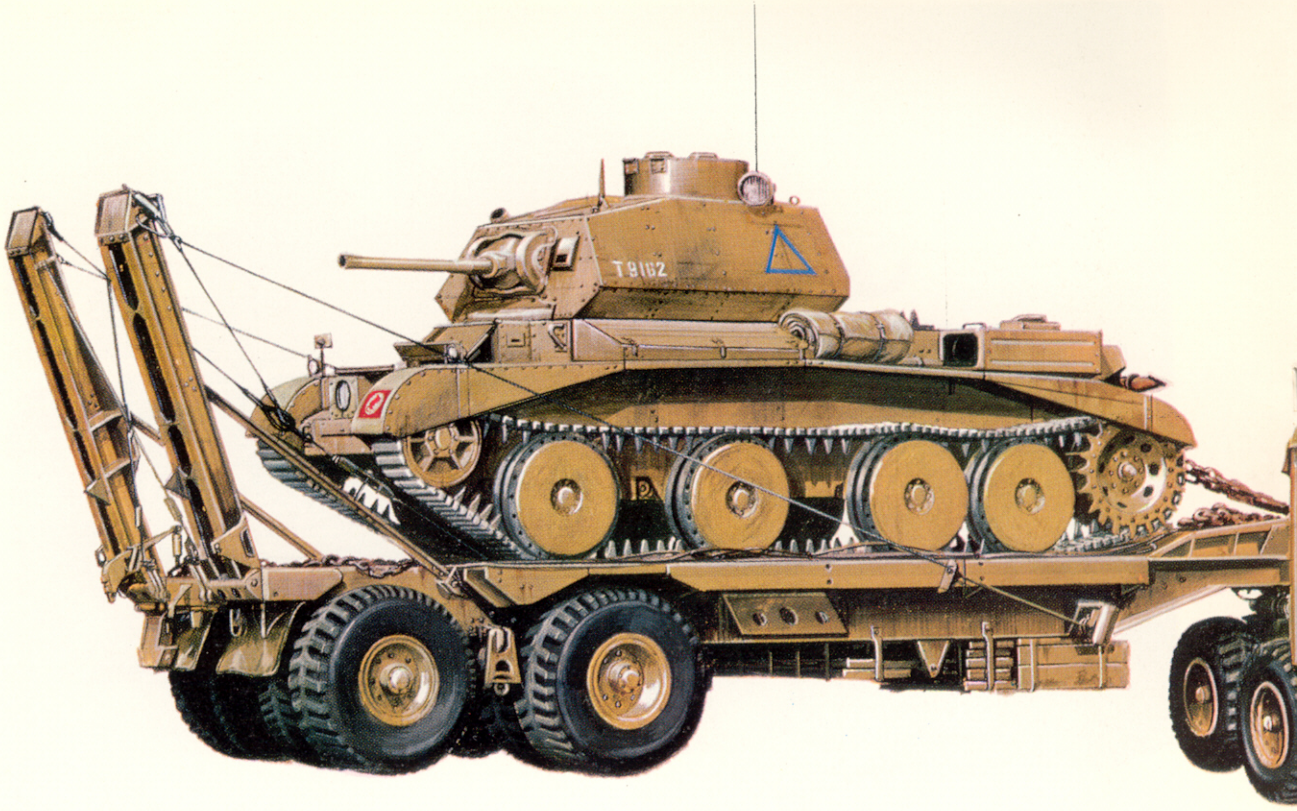




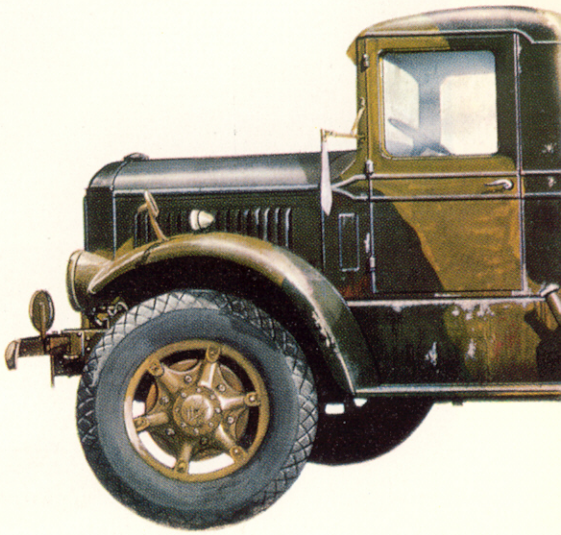
Vickers Medium Mark I experimental wheel and track tank with wheels on ground. Note original pattern suspension bogies and counter-balanced driver's hood here shown closed. (Photo: R.A.C. Tank Museum)

Side view of the Schofield Wheel-and-Track Light Tank built in New Zealand in 1940. Unable to get tanks from Britain the New Zealand Government investigated the possibilities of building its own. This was the only true tank to reach prototype stage. Designed by E. J. Schofield of General Motors (Wellington) it was based on the chassis of the New Zealand-built GMC 6-cwt. commercial truck with track and suspension from a Universal Carrier. The wheels and mechanical units came from the 6-cwt. truck. The cylindrical open-topped turret mounted a 2-pdr. gun and a co-axial machine-gun. When running on wheels, as in this view, the tracks, which had little ground clearance, were looped up by chains. The Schofield had a crew of three.

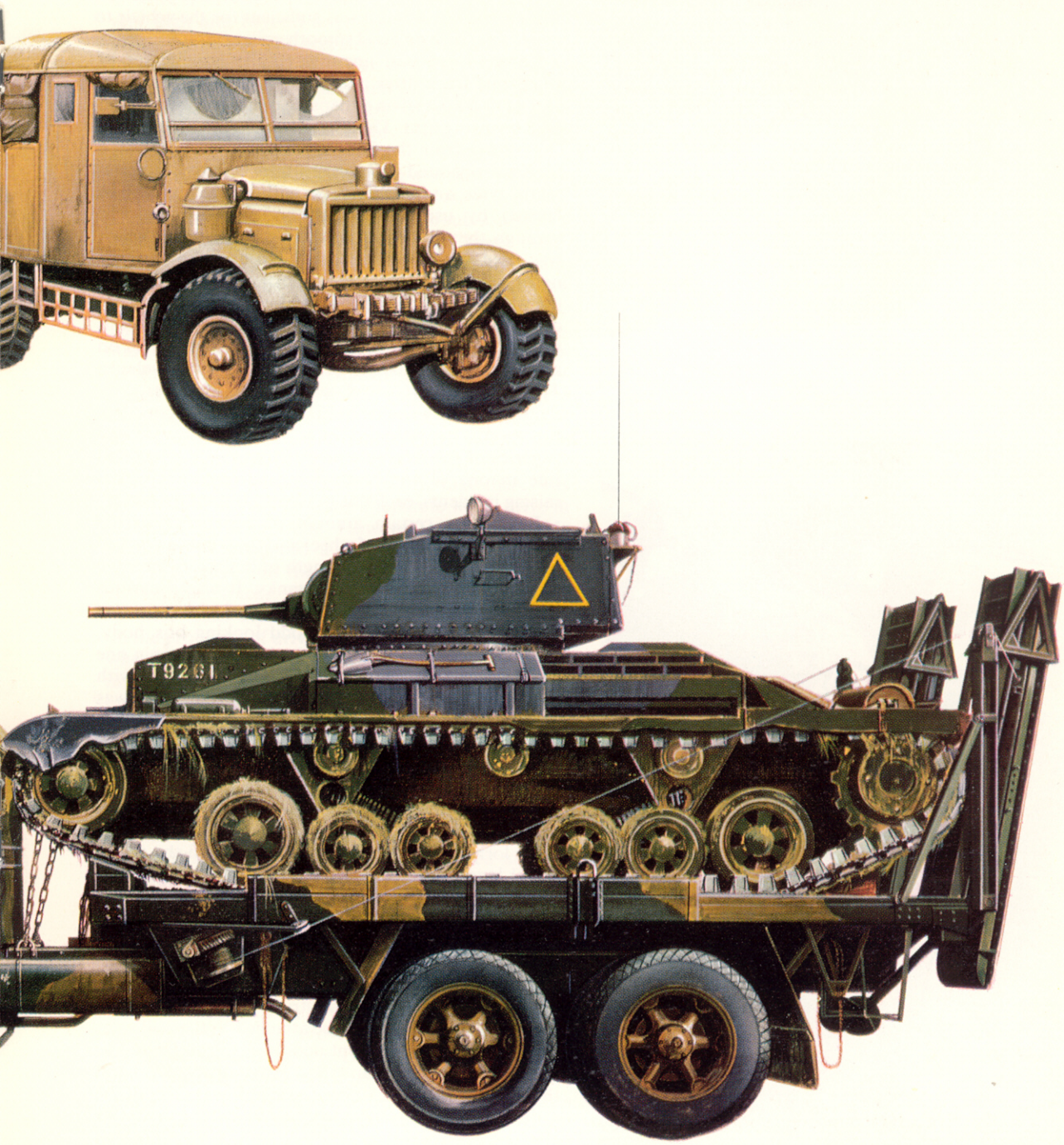


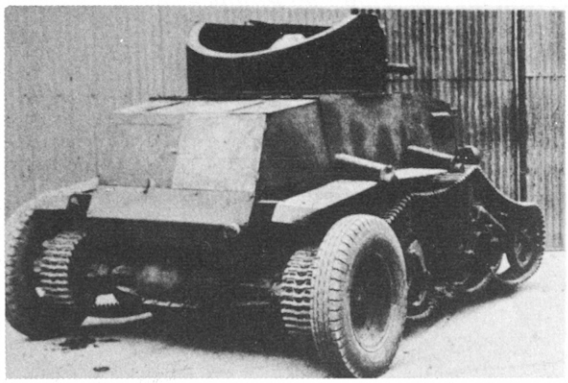


A13 Mark IIA (Cruiser Tank Mk.IVA) on a Scammell 30-ton Semi-Trailer transporter in the Desert.



A10 (Cruiser Tank Mk.II) on a Mack 'EXBX' transporter in the United Kingdom.





Three quarter right rear view of the New Zealand Schofield Wheel-and-Track Light Tank built in 1940. Whereas the wheels were outside the tracks at the rear they were inside them at the front. The wheels shared common stub axles with the sprockets and idlers. When the vehicle was running on tracks the wheels were removed and fitted to stub axles on the hull sides. The change from wheels to tracks was effected by pivoted arms which were operated from inside the tank. The Schofield weighed 5 tons, its armour thickness ranging from 6 mm. minimum to 10 mm. maximum. Its dimensions were: length 13 ft. 1 in., height 6 ft. 7½ in. on tracks, 6 ft. 10½ in. on wheels, width 8 ft. 6½ in. It had a maximum speed of 25 m.p.h. on tracks and 45 m.p.h. on wheels. Only this one prototype was built.

Very early type of track on a Ruston-Hornsby tractor, dating from before World War I now in the Royal Armoured Corps Tank Museum, Bovington. (Photo: Duncan Crow)

armoured car. The machine was only produced in prototype form.

A later version appeared as a touring car in more sophisticated form with a less obvious drive to the rear wheels. The method of transfer from wheels to tracks was the same as in the earlier armoured car version but the jacks were stowed more neatly. The illustration shows the modified form of bogie fitted to both types which is reminiscent of the box bogie introduced in 1931 for the Mark I Vickers Medium tank. The track frames were sprung but the ride was an uneven one and very liable to pitch badly. To overcome this shock absorbers were fitted to the front and back bogies and can be seen in the picture. The clearance when on wheels was small but it was sufficient for the vehicle to move with ease on good smooth going.

Carden-Loyd had investigated the possibilities of wheel and track drive and their Mark V machine-gun carrier had a wheel on either side of the body, mounted on a swinging arm. The wheels which had an optional chain drive from the front sprocket, could be lowered by hand-operated jacks: they were shod with pneumatic tyres and the drive to either wheel could be broken by using the track brakes which worked through the differential of the Ford back axle which was used for transverse drive. No means of disconnecting the track while wheel-borne was provided but the wheel drive could be broken by dog clutches on the driving sprockets. The change from track to wheels was completed by a third steerable wheel mounted on a sprung pivot in the centre of the back of the vehicle. Track clearance on wheels was a matter of inches: with the short wide wheelbase, the problems of reconciling the erratic operation of the track brakes with the vagaries of the steerable pivot wheel made a wheeled ride in one of these vehicles a succession of hair-raising incidents, each one presaging instant disaster!

By 1928 a certain amount of experience in the operation and design of wheel and track machines had been gained and on the strength of it Vickers built the first of several experimental tanks. It was a curious looking affair, constructed in mild steel with a circular turret perched on top of an odd looking box body, with another machine-gun turret behind the main one on the superstructure. Tracks were very narrow with pressed steel plates and the rear driving sprocket was on the ground. Eight independent coil sprung double wheels took the load and there were four return rollers which were so arranged that they gave an odd looking track profile. The rear wheels were inside the track frames while the front wheels were on the normal axle beam and were mounted in front of the track frames. Solid lorry pattern tyres took the load and the actual wheel loading must have been very high. No details exist about this tank but it is believed that the transfer from wheel to tracks was made by raising the wheels clear of the ground thus allowing the track to take the load.

This machine was followed by a second version the same year: in this model the track frames which were complete separate units were attached to the hull sides through slides at the front and back of the tank. The track was of better shape than in the first version and the rear idler had been raised so that it was clear of the ground. The change from wheeled to tracked drive was effected by power-operated jacks which forced down

the track frames until the track bore the load. The body of the second model was little more than a cover for the necessary power trains to operate the jacks and to drive the vehicle. In one respect this tank was better than the first version; the drive to wheel or track was optional and geared to both. However this involved complicated engineering which with the power-operated jacks meant that there was very little room for the luggage in the shape of guns, ammunition and crew!

The second version with its running but not its operating gear is in the R.A.C. Tank Museum: it deserves study as an interesting and ingenious attempt to solve a very real problem. The wheel loading was very high and beyond anything but first-class roads. Wheel-borne the tank was tiring and difficult to drive, top-heavy and a sight to strike terror into all spectators, one of whom once summed up the matter succinctly. "As if," he said, "you had mounted a New York skyscraper on roller skates and driven it round an English barracks."

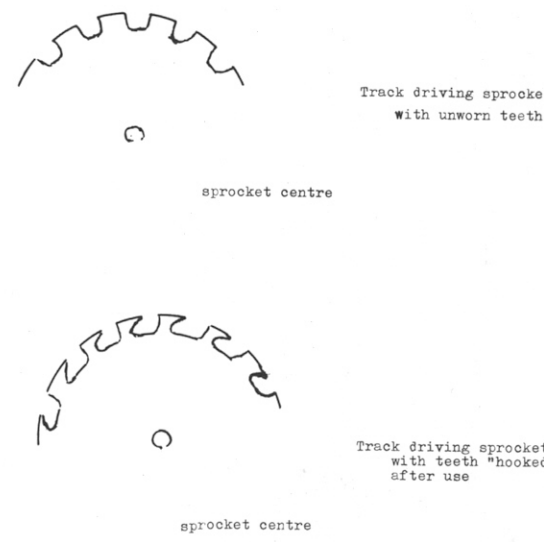
Vickers tried again in 1930 using a Vickers Medium Mark IA to which wheels were fitted in front and rear. These wheels were mounted in separate sub-assemblies with their own power jacks to raise and lower them. When down they were locked in position by struts, one of which can be seen in the picture together with the eye into which it fits on the steering wheel box. The contraption worked and was the best version produced, but the complications of the power operation for the jacks and the alternative drives to tracks or wheels took up a great deal of room and led to the abandonment of the project. The tank was stripped of the extra gear and sent to the 2nd Bn. R.T.C. as a normal gun tank in 1932.

By this time it was quite obvious that there was little chance of incorporating a separate wheel drive in a normal fighting tank. However in America Mr Christie had produced a series of machines which could run either on their large suspension wheels or else on their tracks. Despite the high speeds attained by these tanks the inevitable complications attendant on the problems of driving and steering the suspension wheels led to the abandonment of the dual drive both in America and also in Russia where it had been tried out on an extensive scale.

Track wear was still a problem, lessened it is true, by the inclusion of harder material in the tracks, but none the less present: to reduce it the question of wheeled transporters was examined again on the grounds that there were more roads than railways and that heavy duty tyres were becoming a possibility. In the 1930s light tanks had been delivered all over England on commercial low load multi-wheeled transporters. Attempts were made to develop these for military use without much success except for the Scammel 6×4 prime mover and its trailers which were principally used for recovery work where they performed admirably. The alternative semi-trailer versions were not so successful: they had a high centre of gravity when loaded and were apt to be on the unstable side in consequence. The problem was solved by the American Diamond T 6×4 prime mover and trailer, a big multi-wheeled affair capable of taking the largest tanks. This was a most satisfactory combination and the highly skilled crews who manned this and the other transporters used in World War II saved an infinite amount of unnecessary track mileage. A set of tracks for a tank weighs anything between one and two tons. Replacement tracks for an armoured brigade of 150 tanks may therefore mean moving up to 300 tons of dead weight which can only be accomplished at the expense of something else, ammunition or petrol, each just as vital as the track. Anything that will lessen this burden is worth while and the only problem with the transporter is to make sure that the tank is never caught by the enemy while on its trailer.

Improvements in track design have increased the operational life of the track. Better materials, including the use of rubber, pioneered for tank work by the Americans who set new standards for track reliability, have contributed to this; and the latest British tracks with detachable rubber pads which reduce plate wear while still retaining the self-cleaning action of the grouser bars in heavy going would appear to have the best of both worlds.

Diagram to show type of wearon teeth of World War I tank driving sprockets.



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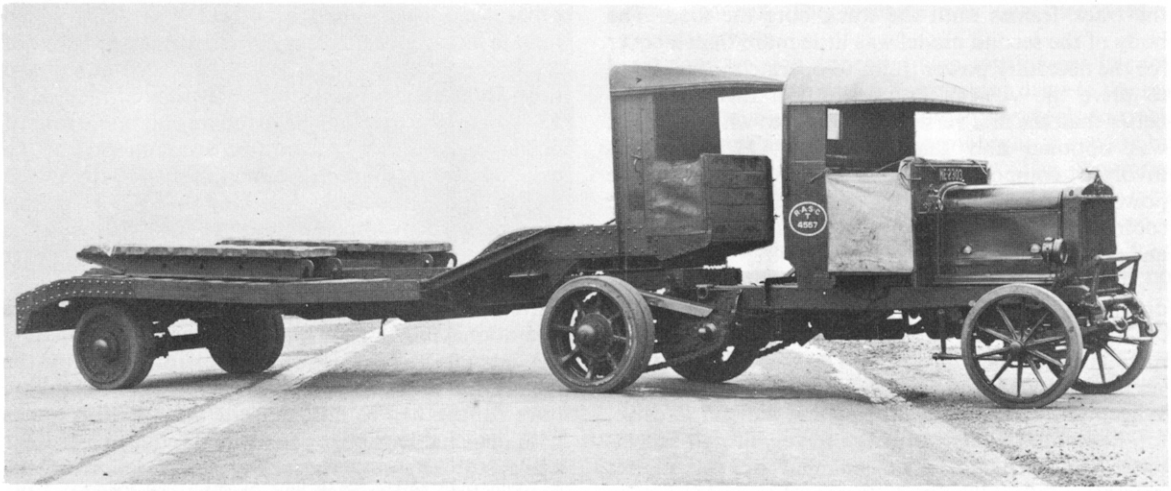
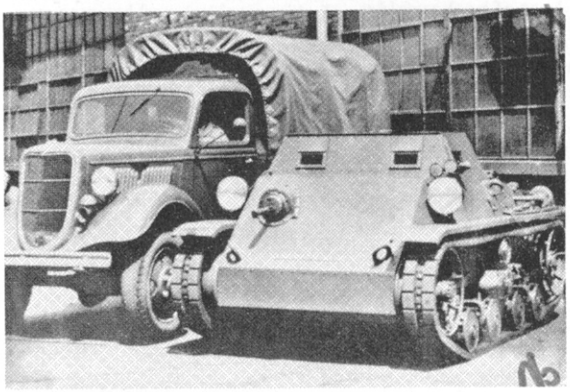


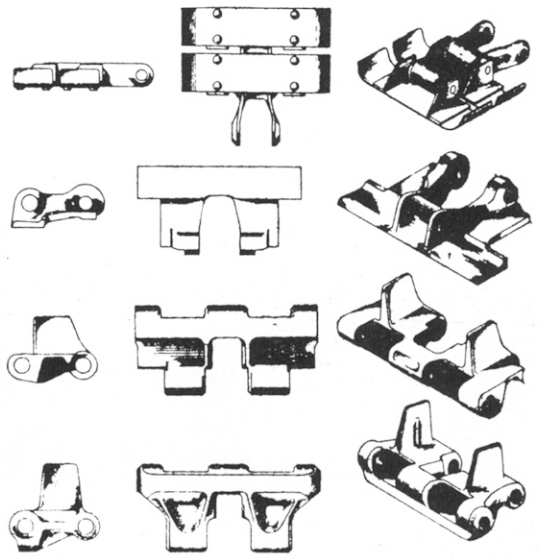
An early A.E.C. semi-trailer tank transporter.
(Photo: Imperial War Museum)



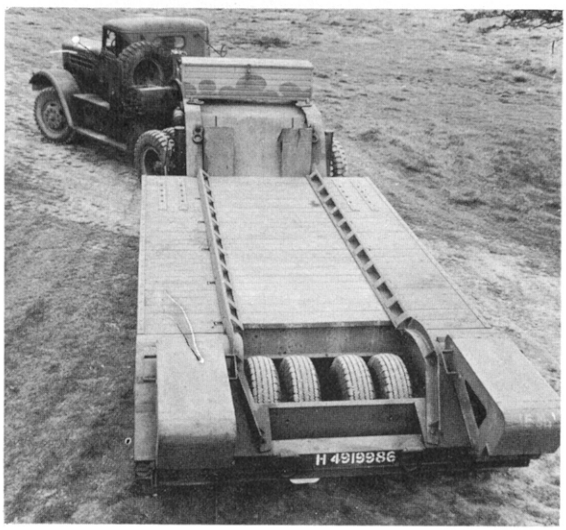
United States Marmon-Herrington Light Tank Type CTL-1 with rubber endless band tracks, 1935. The Americans pioneered the use of rubber for tank work and set new standards for track reliability. Different models of the Marmon-Herrington CTL Light Tank were built for commercial sale from 1935 to 1940. The CTL was inspired by the success of the Carden-Loyd Mark VI. (Photo: Colonel R. J. Icks)

Chieftain with detachable rubber pads which reduce plate wear in tracks. (Photo: Profile Publications)

Close-up of Chieftain track with rubber pads for reducing plate wear. (Photo: Profile Publications)



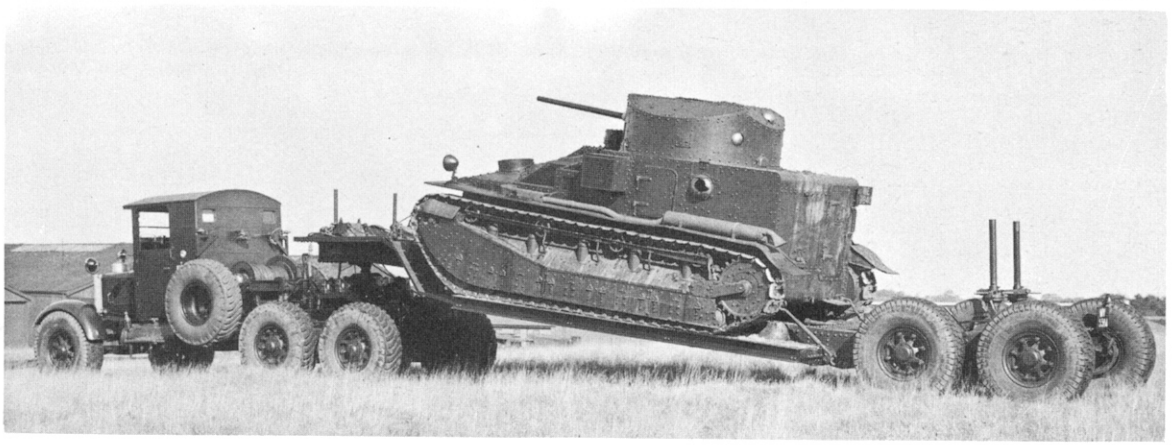
The evolution of the Carden-Loyd track from the modified original conveyor belt basis to the final malleable cast iron track, 1928. It founded a world-wide dynasty of AFV tracks.
(Photo: *Tracks for Fighting Vehicles* by E. W. E. Micklethwait, 1944)



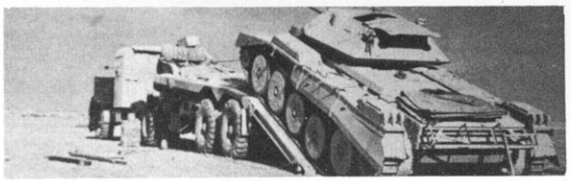
Federal tractor truck, 6×4 diesel.
(Photo: Imperial War Museum)

Scammell tank transporter with Vickers Medium Mark II on board.

(Photo: Imperial War Museum)



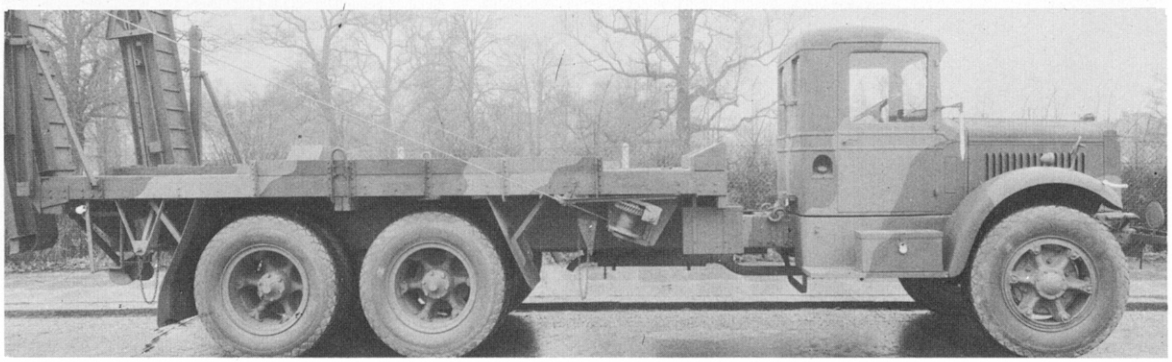
Mack "EXBX" 18-ton Tank Transporter (W.D. No. L770073). Weight unladen 11 tons 1 cwt. gross, weight laden 29 tons 10 cwt. gross (18 ton tank).
(Photo: Imperial War Museum)

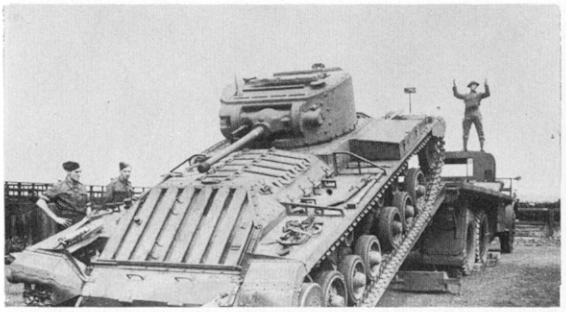


Crusader (Cruiser Tank Mark VI) on the ramps of a Scammell 30-ton Semi-Trailer Recovery Tank Transporter in the Western Desert.

Scammell 30-ton Semi-Trailer Recovery Tank Transporter with a Sherman on board in a desert supply column.

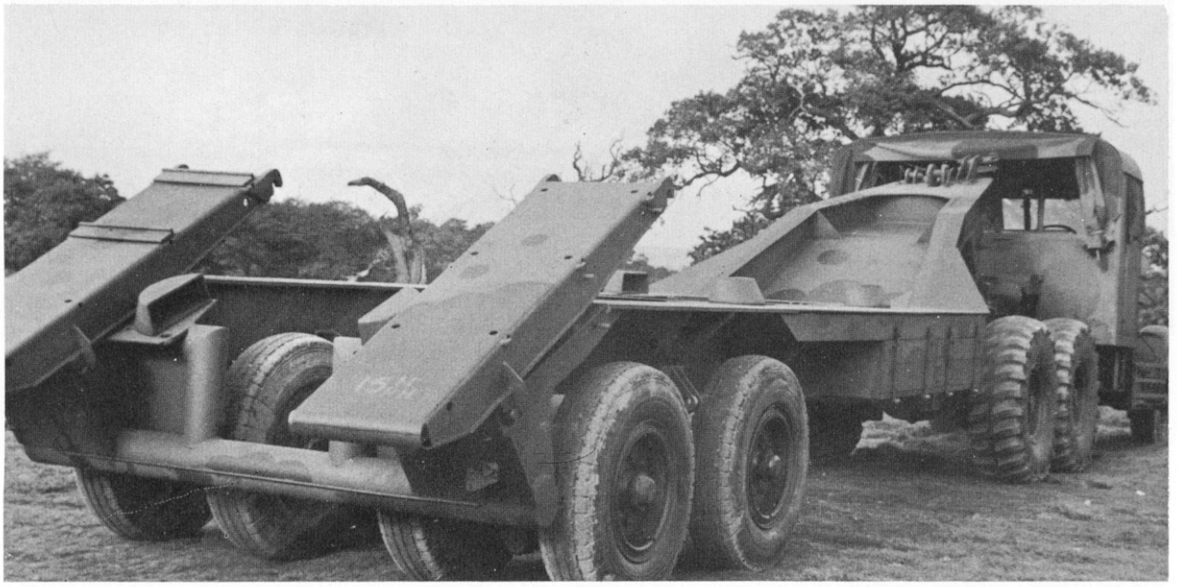
Side view of Mack "EXBX" 18-ton Tank Transporter. Length 29 ft. 5½ in., 30 ft. 10½ in. with folding ramps. Width 10 ft. 1 in. Height 8 ft. 3 in. (cab), 11 ft. 4 in. (folded ramps).
(Photo: Imperial War Museum)





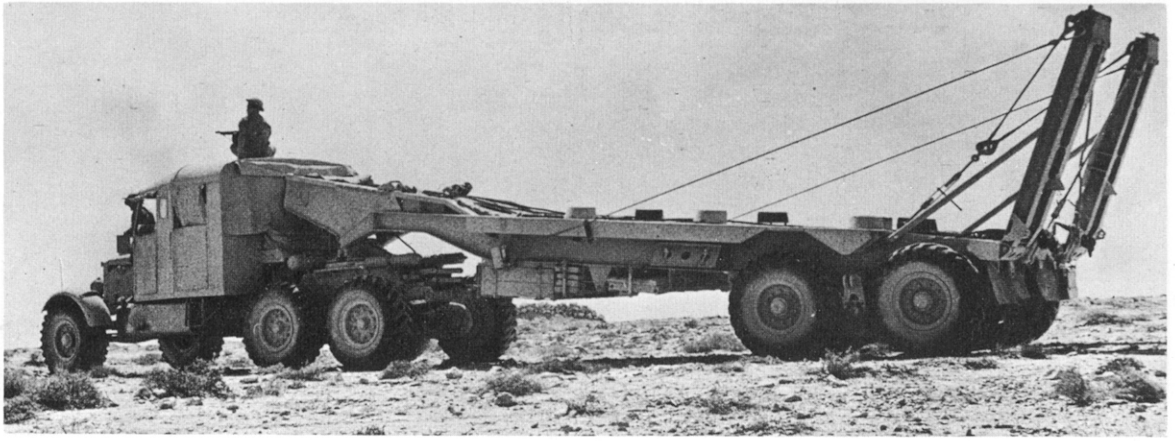
Loading a Valentine on to a Mack "EXBX". The Mack was an American vehicle. (Photo: Imperial War Museum)

Scammell 30-ton Semi-Trailer Recovery Tank Transporter with Matilda on board. Length 49 ft. 8 in. (tractor and trailer with ramps raised). Width 8 ft. 7 in. (tractor), 9 ft. 5½ in. (semi-trailer). Height 10 ft. 11 in. (top of raised ramps), 9 ft. 5 in. (top of cab). Weight unladen 19 tons 18 cwt. gross, weight laden (with Matilda) 49 tons 16 cwt. gross. (Photo: Imperial War Museum)

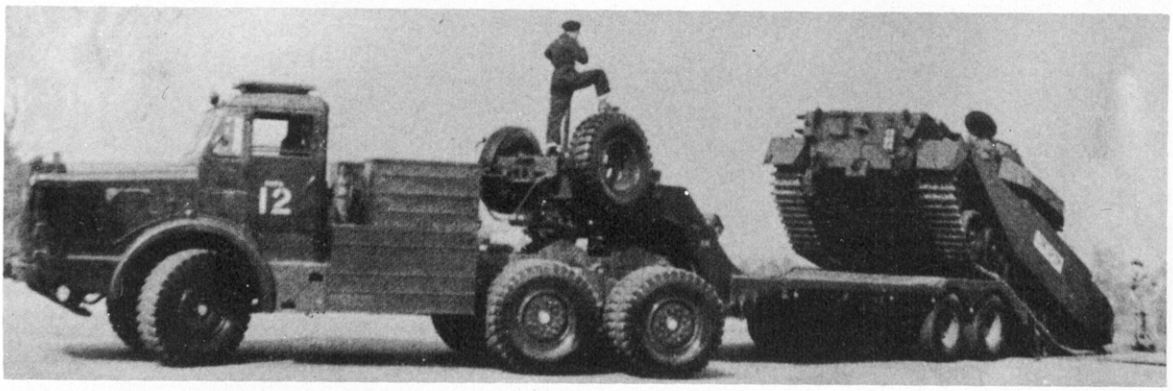


Scammell 20-ton Semi-Trailer Tank Transporter (W.D. No. 4575956). This unit was designed to recover and transport tanks of up to 20 tons, such as the Crusader (Cruiser Mark VI). Length 49 ft. 3 in. (tractor and trailer with ramps raised). Width 8 ft. 7 in. (tractor), 9 ft. 2 in. (semi-trailer). Height 9 ft. 4 in. (top of raised ramps), 9 ft. 5 in. (top of cab). Weight unladen 15 tons 10 cwt. gross. (Photo: Imperial War Museum)

Scammell 30-ton Semi-Trailer Recovery Tank Transporter had the same tractor as the 20-ton version, but is easily recognisable because the floor of the semi-trailer is not parallel to the ground as in the 20-ton version. The Scammell 30-tonner earned a great reputation for reliability, especially in the Western Desert, where this picture was taken. (Photo: Imperial War Museum)

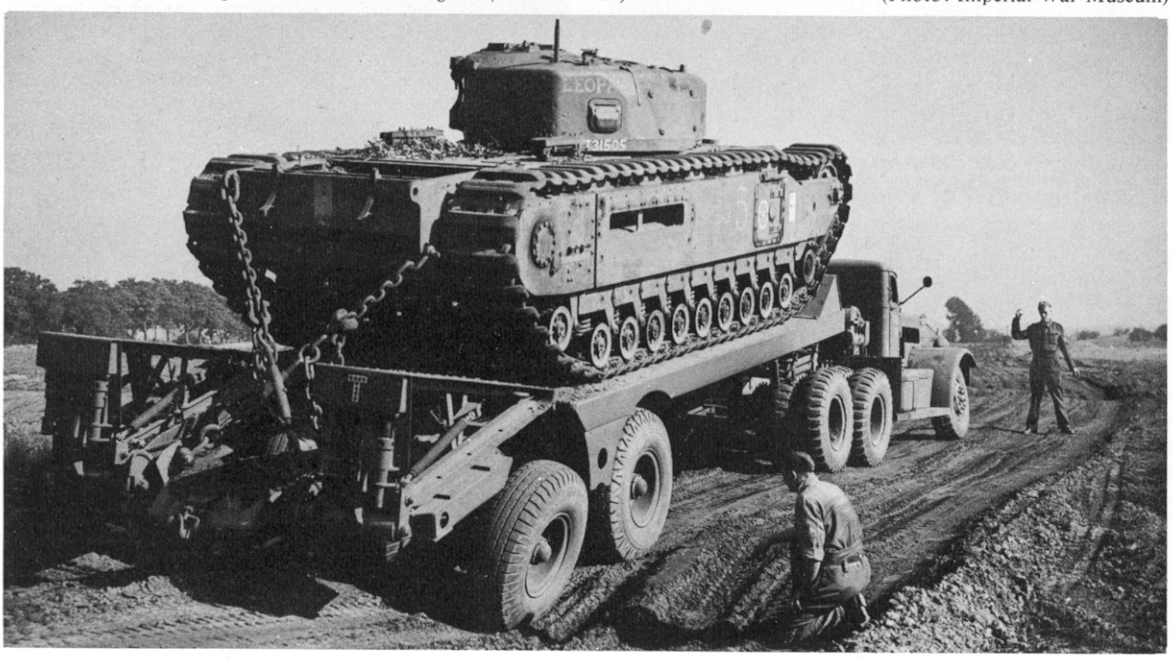


Diamond T 30-ton Semi-Trailer Recovery Tank Transporter being tested in difficult conditions with a Churchill on board. These vehicles, used by British and Canadian tank transporter and recovery units, were powered by a Hercules DFXE 6-cyl. diesel engine.
(Photo: Imperial War Museum)



The British Army's tank transporter of the 1970s is the Antar. Seen here is an Antar Mark 2: FV 12002, Tractor 30-ton 6×4 GS, Thornycroft Antar Mark 2 with FV 30011, Semi-Trailer 50-ton, Tank Transporter. The Antar Mk. 2 has a 285 b.h.p. Meteorite engine which gives it a maximum road speed of 28 m.p.h.
(Photo: Society of Motor Manufacturers and Traders)

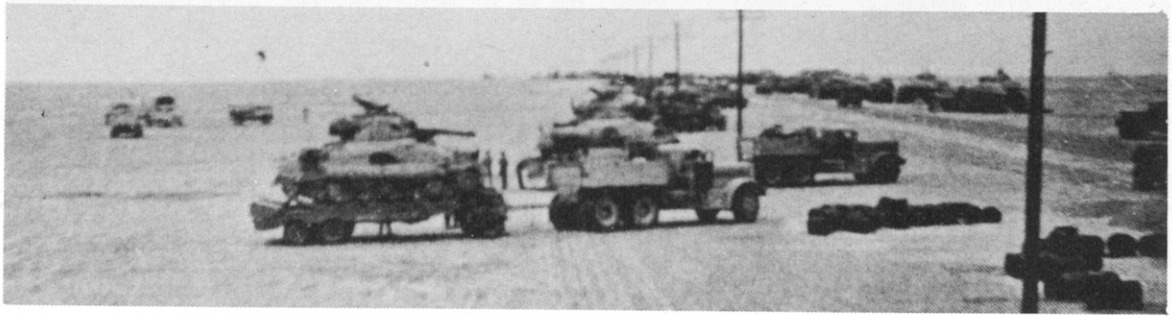
Three-quarter rear view of Diamond T 30-ton Semi-Trailer Recovery Tank Transporter. The vehicle was made by removing the ballast body from a standard Diamond T tractor and replacing it by a semi-trailer turn-table. Shelvoke and Drewry Ltd., who made the semi-trailers, gained an award for the spring-balanced ramp seen in this picture. Length 49 ft. 10 in. (tractor and trailer with ramps raised). Width 8 ft. 4 in. (tractor), 9 ft. 8 in. (semi-trailer). Height 8 ft. 3 in. (top of cab), 8 ft. 0 in. (front of semi-trailer). Weight unladen 22 tons 9 cwt. gross, weight laden 53 tons 8 cwt. gross (with Sherman).
(Photo: Imperial War Museum)



Scammell 30-ton Semi-Trailer Recovery Tank Transporter bringing a damaged Sherman into a R.E.M.E. tank repair workshop in Normandy, July 1944. Powered by a 6-cyl. Gardner engine with 6F and 1R gears, the tractor had a cab large enough for seven men. The two ramps were lowered by small hand winches to give a ramp angle of 18 degrees. Two hydraulic jacks support the rear of the semi-trailer during loading and can be used in wheel-changing and in detaching the semi-trailer from the tractor. (Photo: Scammell Lorries Ltd.)

M19 Recovery Transporter unit with a captured German self-propelled weapon (Panzerjäger IV with 7·5 cm. Stu.K.42 L/70) near Goch during Operation "Veritable", February 1945.
(Photo: Major-General N. W. Duncan)

Shermans of the 9th Lancers, 2nd Armoured Brigade, 1st Armoured Division, loading on to M19 40-ton Recovery Transporter units near Halfway House on the Cairo-Alexandria Road, Egypt 1942. The M19 unit combined the Diamond T M20 tractor and the M9 trailer.



M19 40-ton Recovery Transporter unit, which combined the Diamond T 6×4 12-ton M20 tractor and the 24-wheel 40-ton M9 trailer, here seen loading an American M5 Light Tank (Stuart) "somewhere in England", 1944. Similar British trailers Mks. I and II were also used in the unit. Unlike the American version seen here which terminated the tank carrier runways in a sloping plate at the rear of the front wheels, the British-built trailer had runways continuing on to the front of the trailer and terminating in triangular stop blocks. Length 30 ft. 2 in. (American Rogers Brothers), 31 ft. 11 in. (British Mk. I). Width 9 ft. 6 in. (American), 10 ft. 0 in. (British). Height 4 ft. 9 in. (American), 5 ft. 10 in. (British). Weight unladen 10 tons 2 cwt. gross (American), 13 tons 12 cwt. gross (British). Weight laden (with Churchill) 50 tons 7 cwt. gross (American), 52 tons 14 cwt. gross (British). The tractor was 22 ft. 7 in. long, 8 ft. 4 in. wide, 8 ft. 3 in. high (to top of cab), and weighed 11 tons 18½ cwt. unladen without ballast, 18 tons 18½ cwt. laden with 6·65 tons of ballast. The M19 was the most widely used and longest in service during and since World War II in all parts of the world.
(Photo: Imperial War Museum)

Transporter in need of recovery! M19 Recovery Transporter unit with Buffalo of 11th Royal Tanks, 33 Armoured Brigade, 79th Armoured Division, well ditched near Arnhem, April 1945.
(Photo: Major-General N. W. Duncan)

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41 M103 Heavy + M41 Light (Walker Bulldog)

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42 Swedish Light Armoured Vehicles

Included in this Profile are the Pbv 302 armoured personnel carrier and its derivatives—the Bgbv 82 recovery vehicle, the ingenious Brobv 941 bridgelayer and the IKV 91 infantry gun intended for operation in the north of Sweden, the Norrland: BY R. M. OGORKIEWICZ, author of *Design and Development of Fighting Vehicles* and *Armoured Forces,* and of *AFV/Weapons Profiles 28, 34 and 39.*

43 T-34

The development of the Russian T-34 tank and the discomfiture and surprise of the German army in finding its panzers outclassed by the T-34/76 ("the best tank in any army up to 1943" in Guderian's judgment) are described BY J. M. BRERETON in the first half of this Profile. In the second half a description of the T-34/85 with its increased firepower and a critique of the T-34 in service are given BY MAJOR MICHAEL NORMAN, *Royal Tank Regiment,* author of *AFV/Weapons 17, 18, 19, 23, 27 and 38.* (T34/76 is a revised Armour in Profile, T-34/85 is new).

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