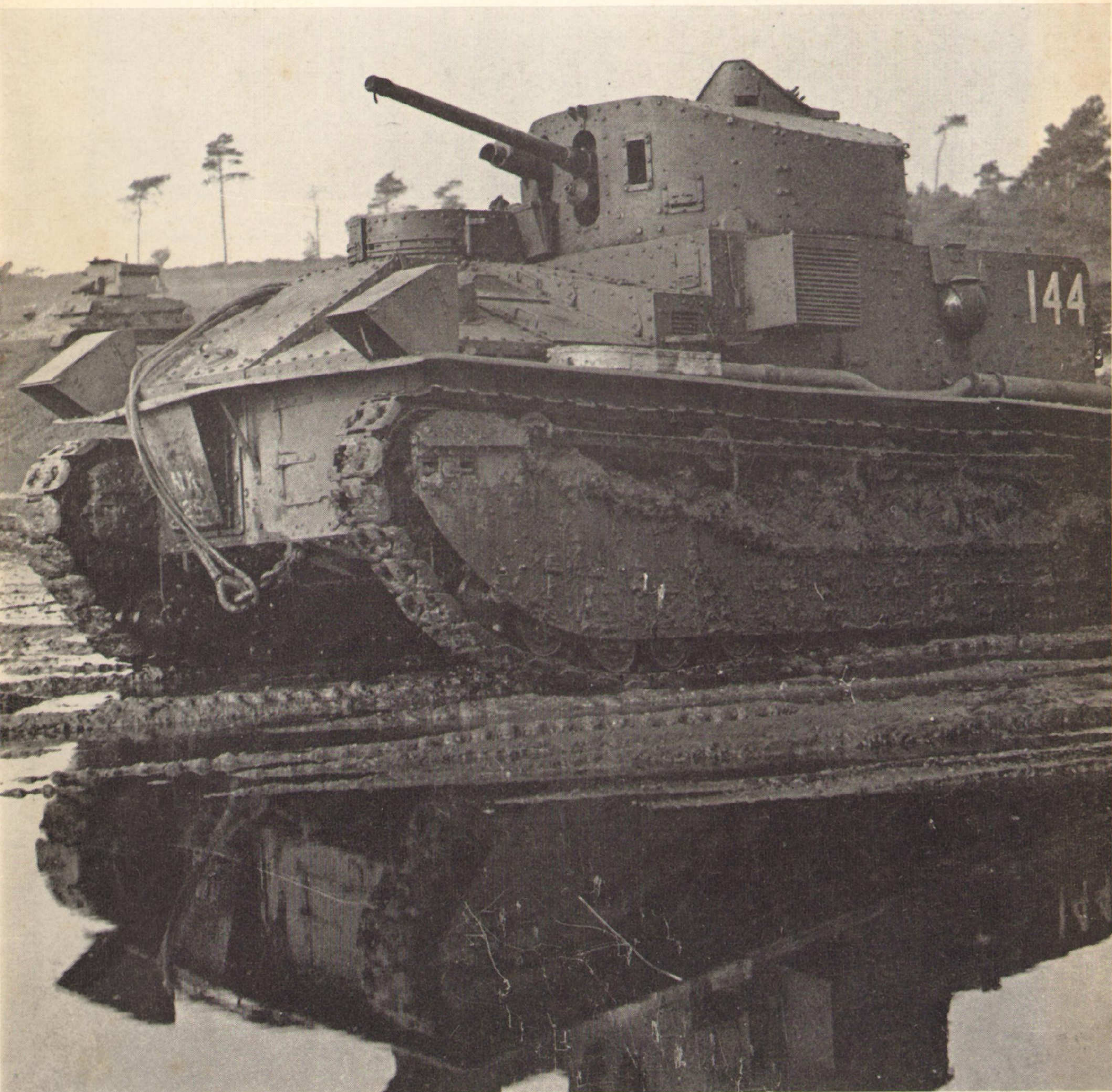


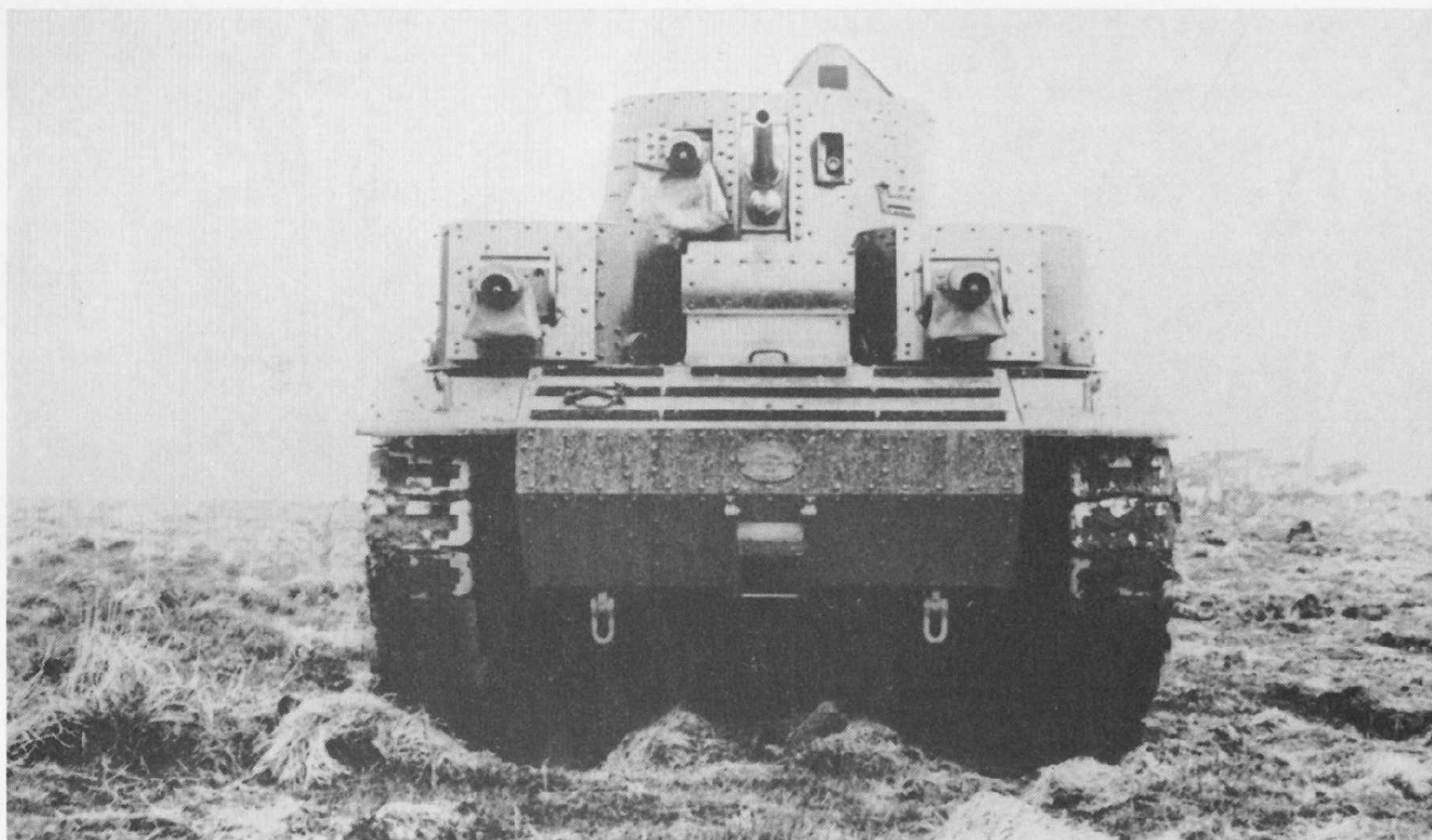
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12

MEDIUMS MARKS I-III

FIVE SHILLINGS





Vickers Medium Tank Mark III. Front view shows armament, gunner's telescope in its aperture, and lack of protection over the observation slot in the command post.
(R.A.C. Tank Museum)

Mediums Marks I-III

by Maj.-Gen. N. W. Duncan

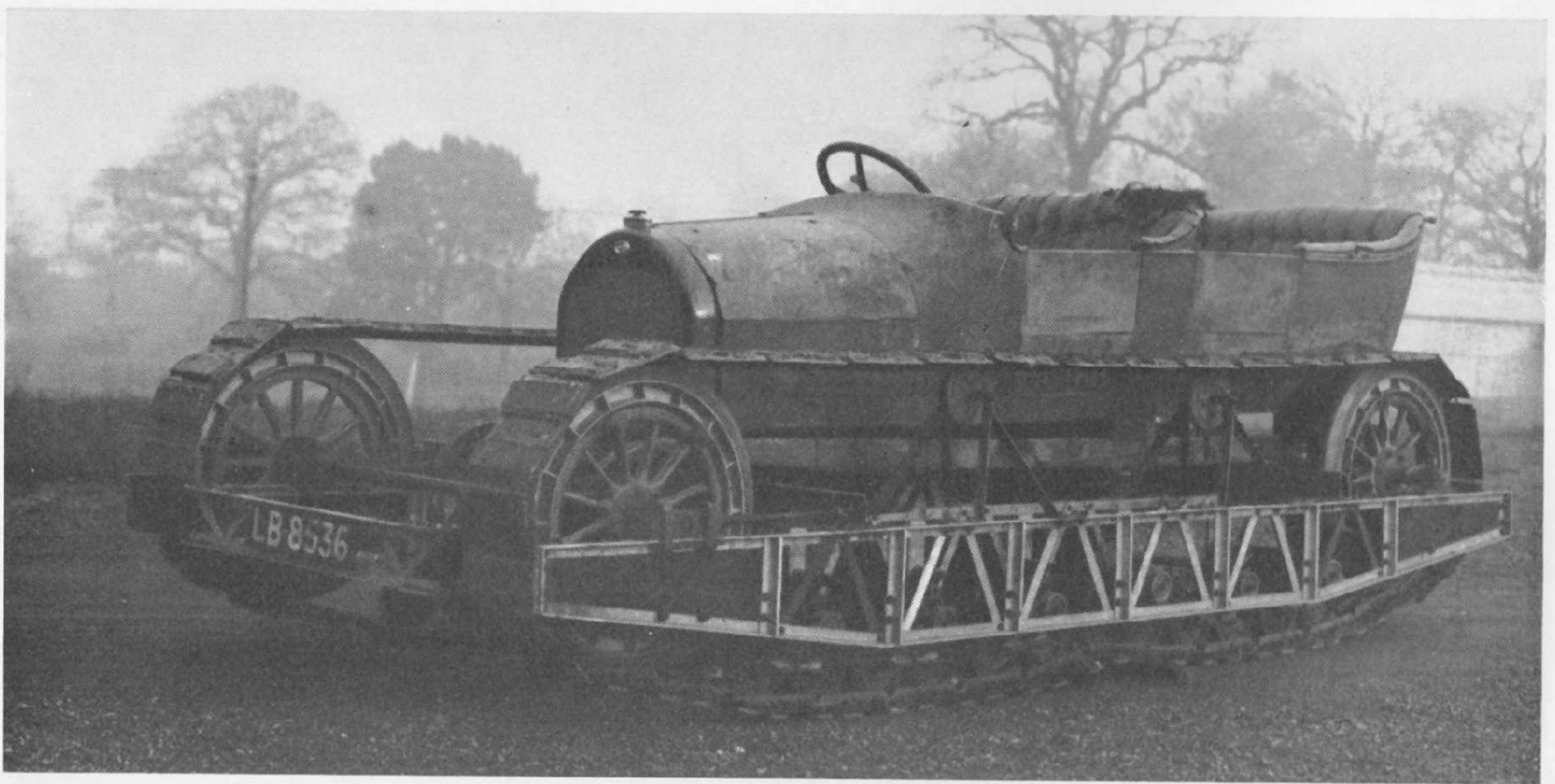
AFTER the First World War there was a widespread feeling of hope that no longer would it be necessary to reckon with the long lines of trenches, covered by machine-guns and wire that had proved insuperable obstacles to so many attempts to break out into open country. This happy state had been foreshadowed in Colonel Fuller's "Plan 1919" which required large numbers of fast-moving tanks to exploit success after an armoured breakthrough. To a greater or lesser extent this fired everyone's imagination and military thought was concentrated on open warfare with static operations tucked far away in the background.

To meet the 1919 plan, tanks of higher speed had been developed: Mediums A, B and C with a speed between 8 and 12 m.p.h., and the Medium D which was designed to do 25 m.p.h. However the latter was discarded because it proved unreliable and a poor fighting chamber so that the army was left with no fast-moving tank except for a few Medium Cs which had been completed after the Armistice and in any case were not really the type of light speedy vehicle that was vaguely envisaged. Therein lay the trouble: no one could make up their mind exactly what the tank was to do in the post-war army. Tanks were both disliked and feared and it is important to realize the depth of feeling against them for it holds the key to much of the muddled thought and procrastination that followed. Prejudice was rife: in 1920 it was stated in print "the cavalry will never be scrapped to make room for tanks" and a senior officer in a lecture held that tanks could never do what horse and man had accomplished in Palestine and ended by saying "we must rely on the man and the horse for really decisive results". Despite the terrible lessons taught by machine-

guns in France, these views were endorsed by the majority of the Army and Corps commanders who had been in France and who helped to increase the prejudice against the tank.

Clear long-range thought on armoured problems was fraught with difficulty. The British Army never attempted to produce a tactical doctrine for the use of armour or even to define its requirements from manufacturers, which accounts to some extent for the original appearance of the Vickers tank as a Light machine in 1923 and its subsequent reclassification as a Medium in 1924. Across the North Sea, defeated Germany had reached her theoretical tank requirements as a result of tactical studies, even defining class weights: the British eventually blundered into a rough definition that anything under ten tons was a light tank with medium types above that figure.

The army had another problem to face over tank construction: fast movement across country brought a crop of new engineering problems and very few firms were either sufficiently interested or had enough experience to undertake development work of this nature. Vickers-Armstrong for years were the only civilian firm who would do tank work and their only competitor was the Royal Ordnance Factory at Woolwich. The experimental budget was a small one and production orders for tanks were on such a diminutive scale as to afford little inducement for concentrated effort. Despite all these difficulties a great deal of experimental work was carried out from 1926 to 1937 under the continually renewed Cabinet statement that no war was likely for ten years. Continued reiteration inhibited any sense of urgency and virtually meant that all designs remained experimental and were



During development of Johnson's Light "D" Tank, experimental tracks were fitted to an Overland chassis. (Imperial War Museum)

never finalized for production. It was not until 1938 when war was declared to be imminent that tank production, as opposed to tank development, assumed a position of overriding importance.

PART ONE 1921—1926

The story of the post-war Medium tank really begins with the closure of the Tank Design Department, on the grounds of economy, in 1923. The Department had evolved a light infantry tank from the Medium D and although it proved unreliable, despite promising features, it stimulated Vickers-Armstrong to produce a light infantry tank which was running in 1921—not, incidentally, a tank for light infantry but a light tank for use with infantry.

VICKERS LIGHT TANK, 1921

It may seem anomalous to commence an account of Medium tanks with the description of a light tank: the reason lies in nomenclature, for the Medium tanks were originally known as Light tanks. Vickers built two prototypes of their Light tank which appeared in 1921. These looked rather like a Medium B as far as the general outline: the track form was the same and the side doors were retained although the bulge in them to allow the side of the tank to be covered by revolver fire was eliminated. The squat ugly superstructure was replaced by a hemispherical revolving turret with 360° traverse and a turret ring 67 in. in diameter. The commander had a cupola, which could be opened, in the centre of the turret.

The tank weighed 8½ tons and carried ½ in. armour. An 86 h.p. engine drove through cross shafts Williams-Janney infinitely variable hydraulic units which also provided the means of steering the tank. All the power train was housed in a separate compartment at the back of the tank. The track was sprung by articulated bogies controlled by vertical helical springs working in enclosed guides.

The two tanks, Nos. 1 and 2 differed in their armament: No. 1 appeared with three ball mountings for Hotchkiss MGs in the turret sides while No. 2, which was completed in the remarkably short time of five and a half months, carried a 3-pdr. gun and also had three Hotchkiss mountings for ground work and an additional position in the back of the turret roof for AA work. 50 rounds of 3-pdr. ammunition were carried and 6,000 rounds of SAA.

The Vickers Light Tank, 1921, was commendably low, standing about 7 ft. from the ground but it proved unreliable mechanically and the project was abandoned in 1922.

VICKERS MEDIUM TANK MARK I

(originally Vickers Light Tank Mk. I)

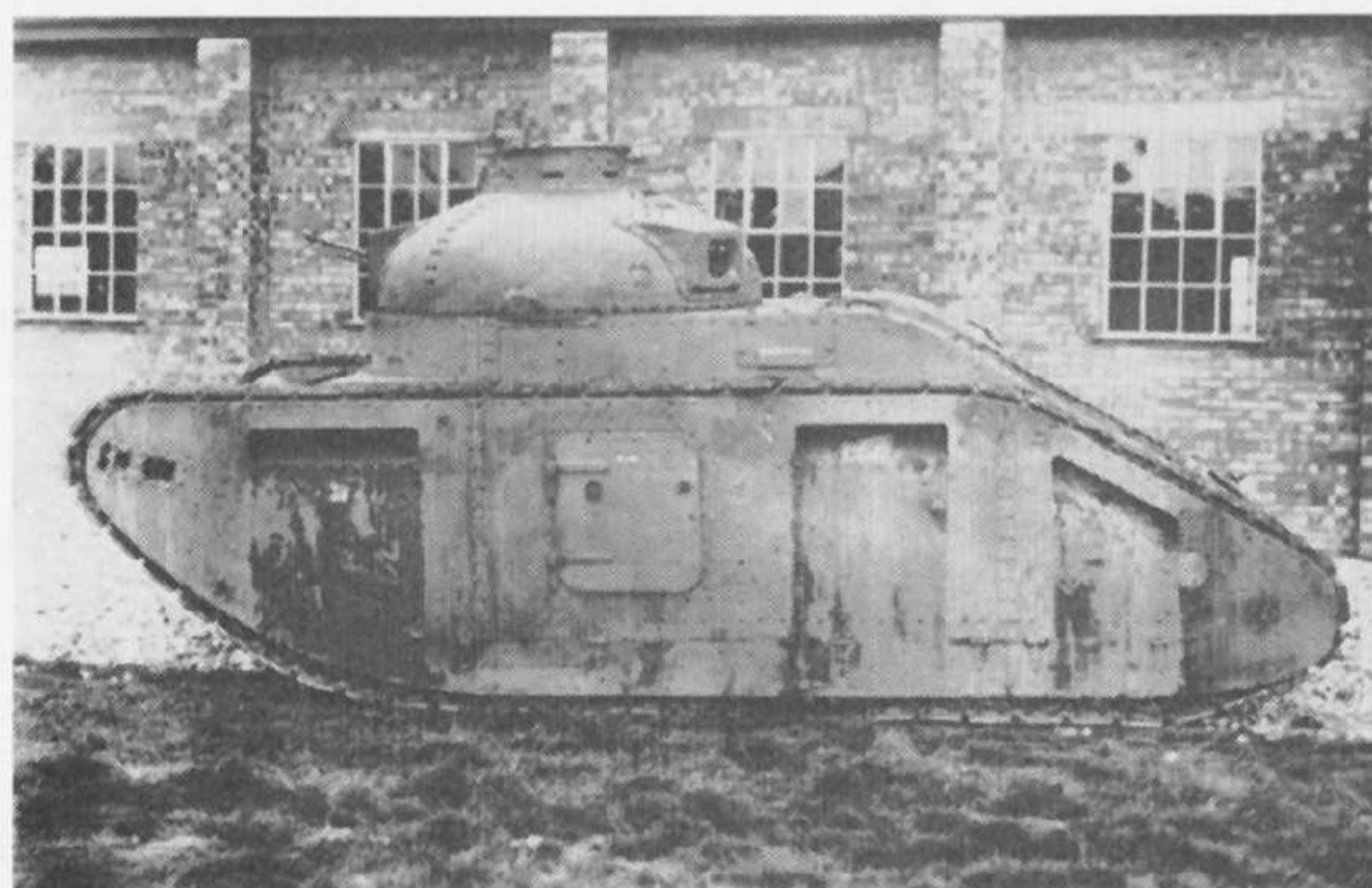
Following the failure of their first tank, Vickers-Armstrong designed and built the Vickers Light Tank Mark I and sent the first models to the Central Schools at Bovington for trial in 1923. Some trouble was experienced with the brake bands owing to faulty lining—there was a hideous moment when one of the experimental models suffered steering failure in the middle of a long and very narrow bridge—but this was soon overcome and about 200 Mark Is and IIs were built. They remained in service with the Royal Tank Corps until 1938/39, a record for longevity only equalled by the Rolls Royce armoured car. They could have been replaced earlier for there were a variety of designs and prototypes from which to choose, but no one in the War Office could make up their mind about the future rôle of the tank: consequently no design was ever finalized for production and the Tank Corps had to train with machines which were blatantly unfit for battle. British tank design was probably better than any other in the world at the time but the shortage of orders and money, and the lack of a clear decision on requirements, never gave tank production a chance.

In the '20s the technique of welding armour plate had not been perfected and armour plates were secured by rivets to a frame or chassis of angle iron which was stiffened by gussets and corner plates to resist the strains imposed on the structure by cross-country movement. Mark I's chassis was a box, rectangular in shape, with a smaller box in front of this to contain the engine and the driver alongside it. Between the engine and the driver was a double asbestos and steel partition. Seven plates on each side and six on the floor, made from homogeneous armour .25 in. thick were attached to the chassis. On top of the main superstructure was a revolving turret carrying a 3-pdr. gun with geared traverse and elevation and four Hotchkiss MGs in ball mountings: one of these, at the back of the turret, which was cylindrical in shape, was intended for use against aircraft. The sides of the turret were bevelled and a circular opening in the centre protected by a hinged lid was provided for the commander who was expected to control his crew by word of mouth. The 3-pdr. was fired by pressing the elevating hand wheel.

Two Vickers MGs in armoured jackets were carried in big ball mountings on either side of the tank just behind the escape doors. These VMG gunners only had limited observation and their firing position, kneeling on one knee, was uncomfortable in the extreme.

The Vickers Mediums, as they were renamed in 1924, were powered by an Armstrong Siddeley engine of 90 b.h.p., air-cooled and developed from contemporary aircraft engines. The drive was taken from the engine by a multiple dry-plate clutch to a four-speed gearbox without synchromesh which provided any driver with a real challenge if it was to be handled silently. A propeller shaft ran to the bevel box at the back of the tank which carried at either end of its cross shafts a two-speed epicyclic gear providing both emergency low ratios on the 1st and 2nd gears and also a means of steering the tank. The whole of the mechanism was scattered about the tank: gone was the rear power compartment, pioneered by the Medium Bs and Cs of war-time days. The engine was perched in front alongside the driver, the gearbox was under the commander's feet and the bevel box and epicyclics were at the back underneath the petrol tanks which were attached to the rear wall inside the

Vickers Light Tank 1921 No. 1, showing the mountings for the Hotchkiss guns. Note superficial resemblance to Medium Mark B, except that side door is no longer bulged and hemispherical turret has replaced angular superstructure. (R.A.C. Tank Museum)



machine, an unbelievably retrograde step in view of war-time experience.

The Armstrong Siddeley engine had steel cylinders, an innovation for land use, shrouded by an aluminium casing. Air was drawn through the casing by a fan running in a circular chamber carrying oil cooling pipes on its inside circumference. A clutch allowing limited slip was incorporated in the drive to absorb shocks from sudden changes in engine revolutions. Oil, which played a considerable part in cooling the engine, was carried in a separate four-gallon tank, later increased to one of 13½ gallons, and circulated by the pressure side of a combined pressure and scavenging pump. Bearings were lubricated by pressure through drilled passages and considerable reliance was also placed on splash. Oil consumption was heavy.

Petrol was supplied to the two Claudel Hobson carburettors by gravity from a petrol-feed tank in the driver's compartment: this was kept filled by a special Briggs fuel pump, driven from the engine, the surplus being returned to the main tanks.

Two 4-cylinder magnetos were mounted on a bracket on the front engine cover and flexibly coupled through spur gears to a bevel drive from the crankshaft. Each magneto fired one bank of cylinders and a hand magneto was provided to assist starting. Mark I tank could only be started from the inside by hand but an aperture in the front plate was provided in Mark IA and Mark II tanks which allowed them to be started from the outside. An electric starter motor was fitted as part of a complete 12-volt system but the motor was not notably efficient and could only be used when the engine was warm. All Mark Is and IAs were difficult to start and there was one notable occasion after a fortnight's Christmas leave when a battalion took six hours to start three tanks out of 30 following a period of severe frost!

On either side of the tank there were five suspension units, each housing two helical springs, one three times as long as the other, the differing differential rates being designed to absorb varying shocks. The bogie casing was bolted on to the tank and enclosed a connecting trunk pivoted to the bogie frame. At either end of this was a short axle which carried two small suspension wheels, each bearing on the inside of the track astride the guiding horns. The suspension wheels cantilevered out from the bogie frames were a perpetual nuisance. The axles were continually breaking and the path of the Mark I tanks was littered with discarded wheels. In 1931 a box bogie which

Vickers Light Tank 1921 with commander's cupola open. (R.A.C. Tank Museum)





Vickers Light Tank 1921 No. 2 during trials with 3-pdr. gun mounted.
(R.A.C. Tank Museum)

gave support to the outboard ends of the wheel axles was introduced and as a result trouble virtually ceased. Inclined single-wheel suspension units bore against the inclined portions of the track and an adjustable idler wheel at the front end took care of track tension. No shock absorbers were fitted and the ride was apt to be very rough at speed.

The upper run of the track was supported by four return rollers attached to the suspension units. The Mark I wheels with metal rims were later changed for the Mark II type with rubber tyres which proved far more satisfactory. The tracks were originally built by rivetting a sole plate to a connecting link but these

were replaced by the No. 3 track which had both sole and connecting link formed in one nickel steel stamping. Each plate had a recessed hollow in it but as there was no means of cleaning out the mud which lodged in its interior it was not particularly effective. Track plates were 13 inches wide and were joined by headed hollow track pins secured in place by a spring washer and nut on the threaded end. Ground pressure was very high—between 30 and 40 lbs. per sq. in.—and the 132 plates, 66 each side, weighed 2,604 lbs. for the No. 3 pattern.

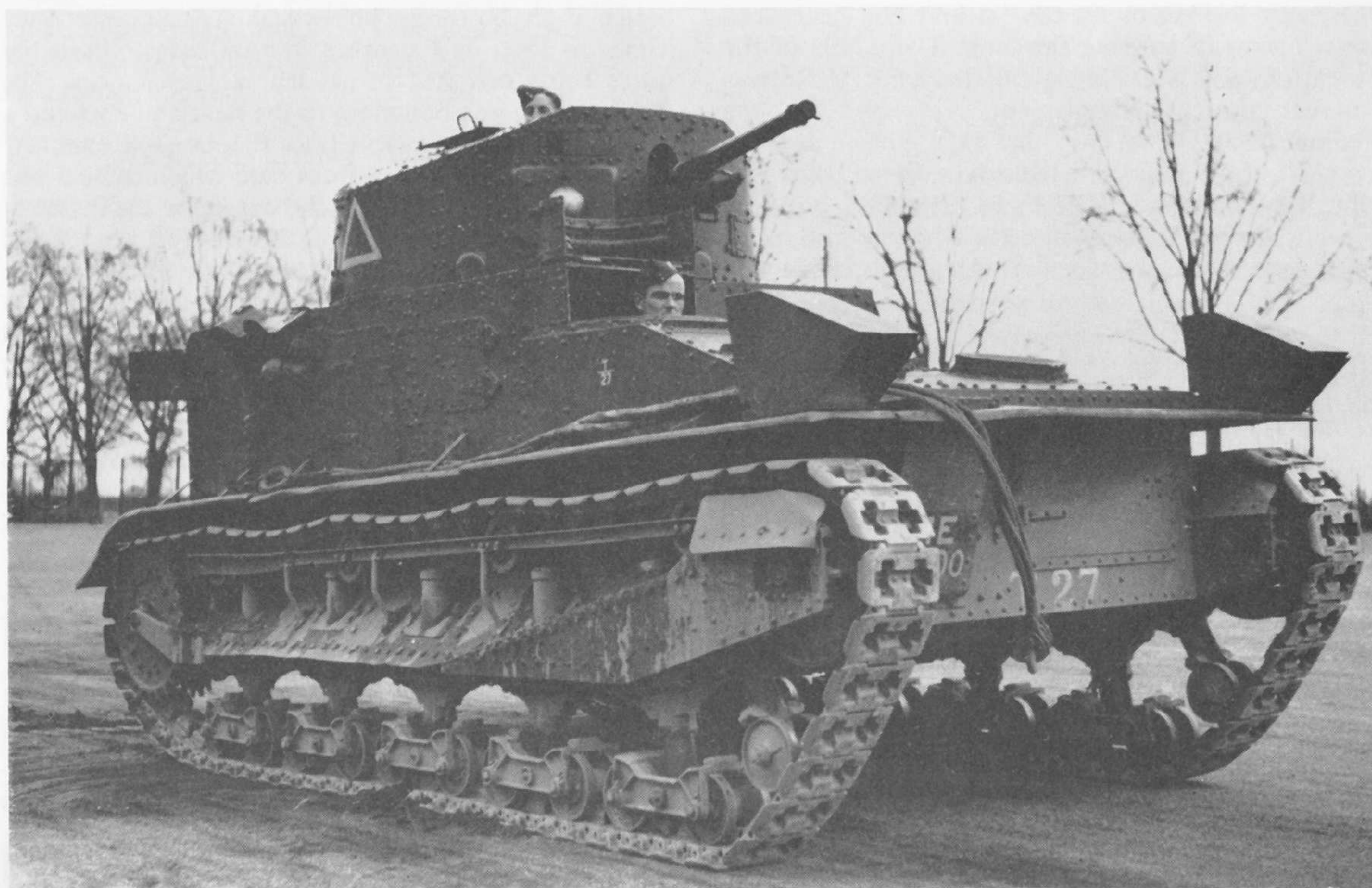
MARK IA MEDIUM TANK

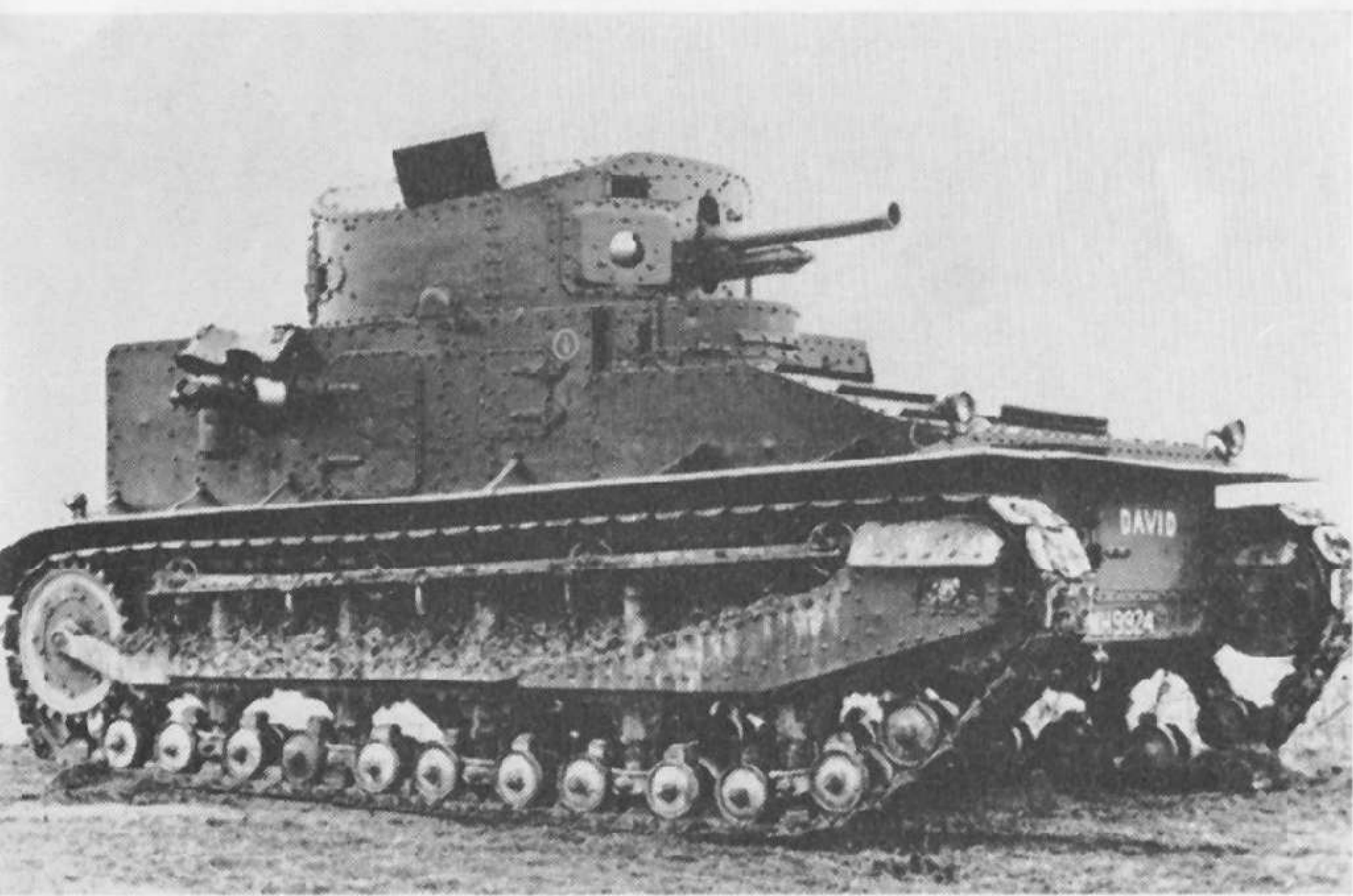
The first thirty Mark I tanks were followed by fifty Mark IAs. Externally there was little difference between the two. The Mark IA had slightly thicker armour, using both .25 in. and 8 mm. (approximately .33 in.) plates, and the driver's hood was split vertically down the centre allowing each half to swing back: the top plate folded back on to the superstructure in contrast to the Mark I where the driver's hood was hinged to fold back as a complete unit.

The back plate of the turret was bevelled in the Mark IA which gave the Hotchkiss a better chance in its AA rôle and an opening was provided in the front plate to allow the engine to be started from the outside. Inside the tank, brow and chin pads for the gunners were of improved pattern and a primitive locking plunger in the hand traversing gear for the 3-pdr. which had never been satisfactory was abandoned.

Vickers Medium Mark I showing driver's hood hinging back as one unit.

(Imperial War Museum)





Vickers Medium Mark I CS with a 15-pdr. mortar in place of the 3-pdr. for close support. The box on the side of the turret is for signal flags. The bogies are the early open type.

(R.A.C. Tank Museum)

MARK IA★ MEDIUM TANK

The Mark IA★ can be distinguished by the coaxial VMG mounted alongside the 3-pdr. in the turret and by the absence of the Hotchkiss MG mountings. A lead counterweight was bolted to the back of the turret to compensate for the weight of the armoured jacket and a command post (officially described as a "Bishop's Mitre" from its shape when opened) was fitted above the circular opening in the top of the turret; this had independent traverse and could be opened at need; no bullet-proof glass was fitted.

The difficulties which the side VMG gunners faced in handling their weapons were paralleled by the

problems confronting the 3-pdr. gunner. No seat was provided for him and he had to crouch over his handles, his right hand working in the horizontal plane controlling the traversing wheel, and his left in the vertical plane operating the elevating gear which also carried the firing handle. A telescope of 1/1 magnification carried cross wires and elevation was put on the sighting drum to alter the angle of sight relative to the bore. Co-ordination of hands was particularly difficult owing to the wide spacing of the handles and before the annual gunnery camp Vickers Medium tank commanders and gunners were to be seen stalking about barracks waving their hands in mystic circles to achieve automatic co-ordination of hand and eye.

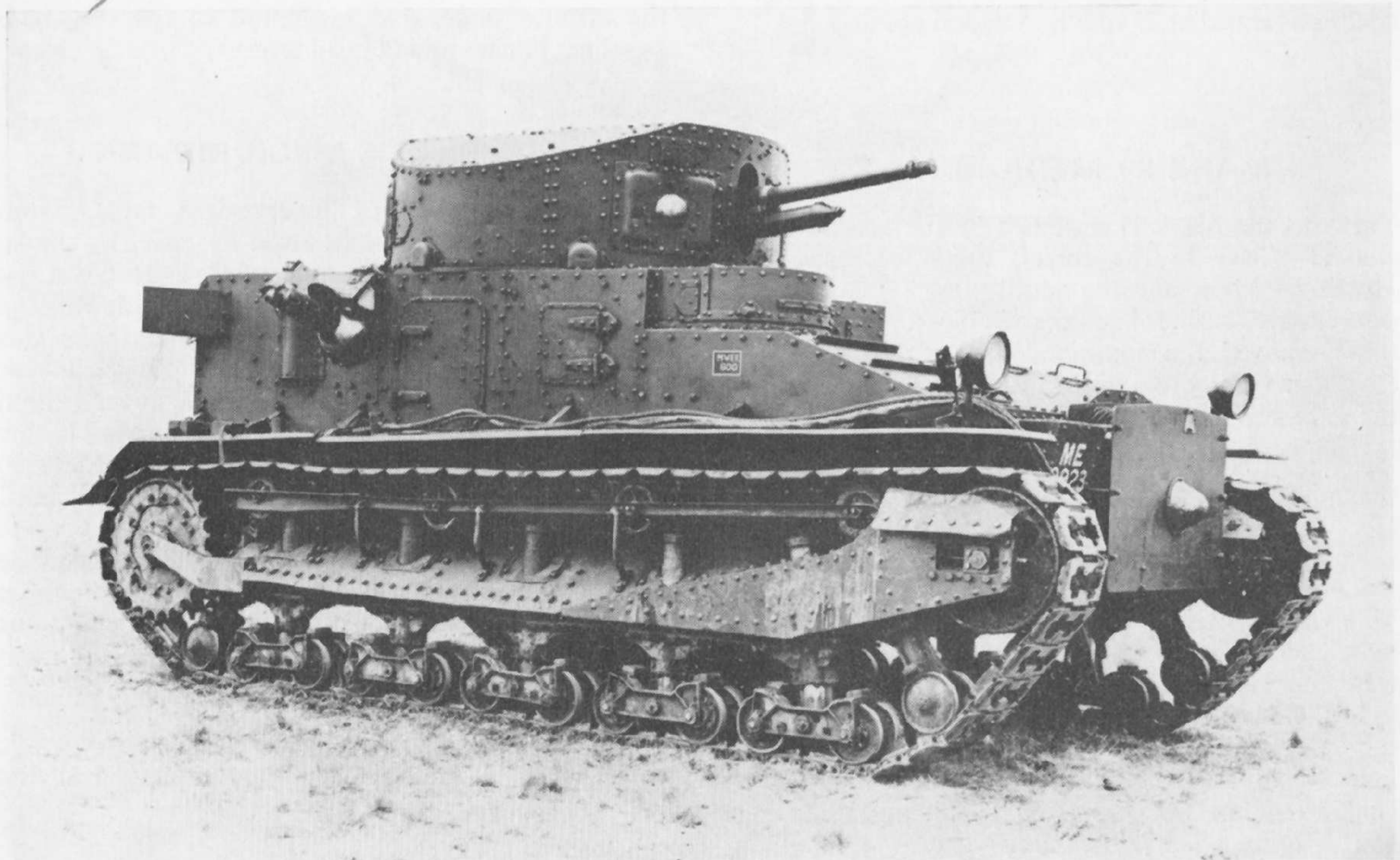
MARK II MEDIUM TANK

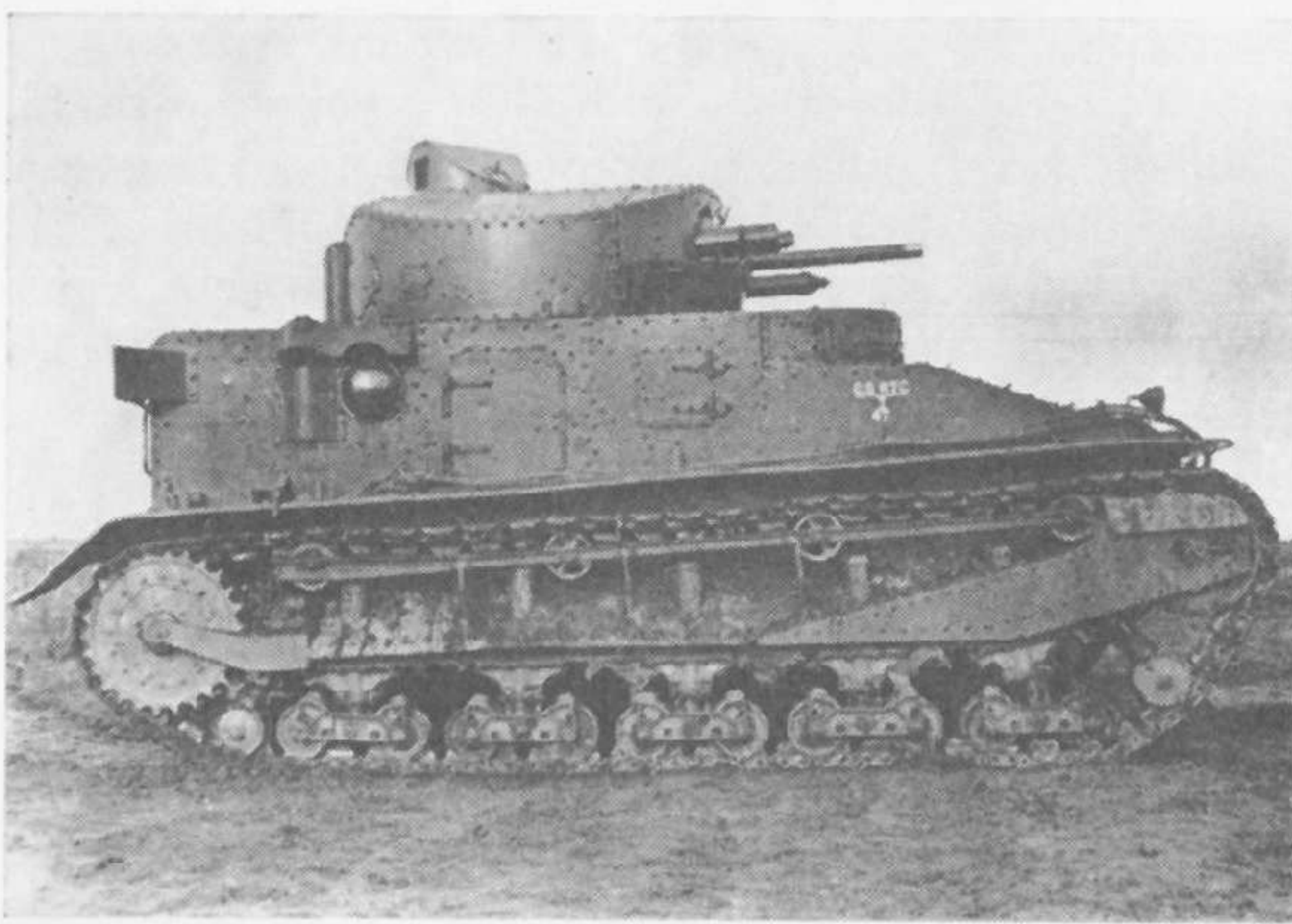
100 Vickers Medium Mark II tanks were supplied to the British Army from 1925 onwards and they were in service until 1938/39 and were then used in Training regiments for initial instruction in tracked vehicle driving during the early days of World War II. The same chassis, engine and transmission were used but the exterior shape was changed, the Mark IIs appearing much bulkier. The hull superstructure was a little higher and the driver's hood stood proud of this; the driver's vizor was divided in two and the top hinged back as in the Mark IA. Skirting plates were fitted over the suspension, and the box bogies, still controlled by vertical springs, were located by slipper blocks moving in external guides.

The epicyclic gears for steering and emergency low ratios were operated by Rackham clutches which were a form of servo control, mechanically operated.

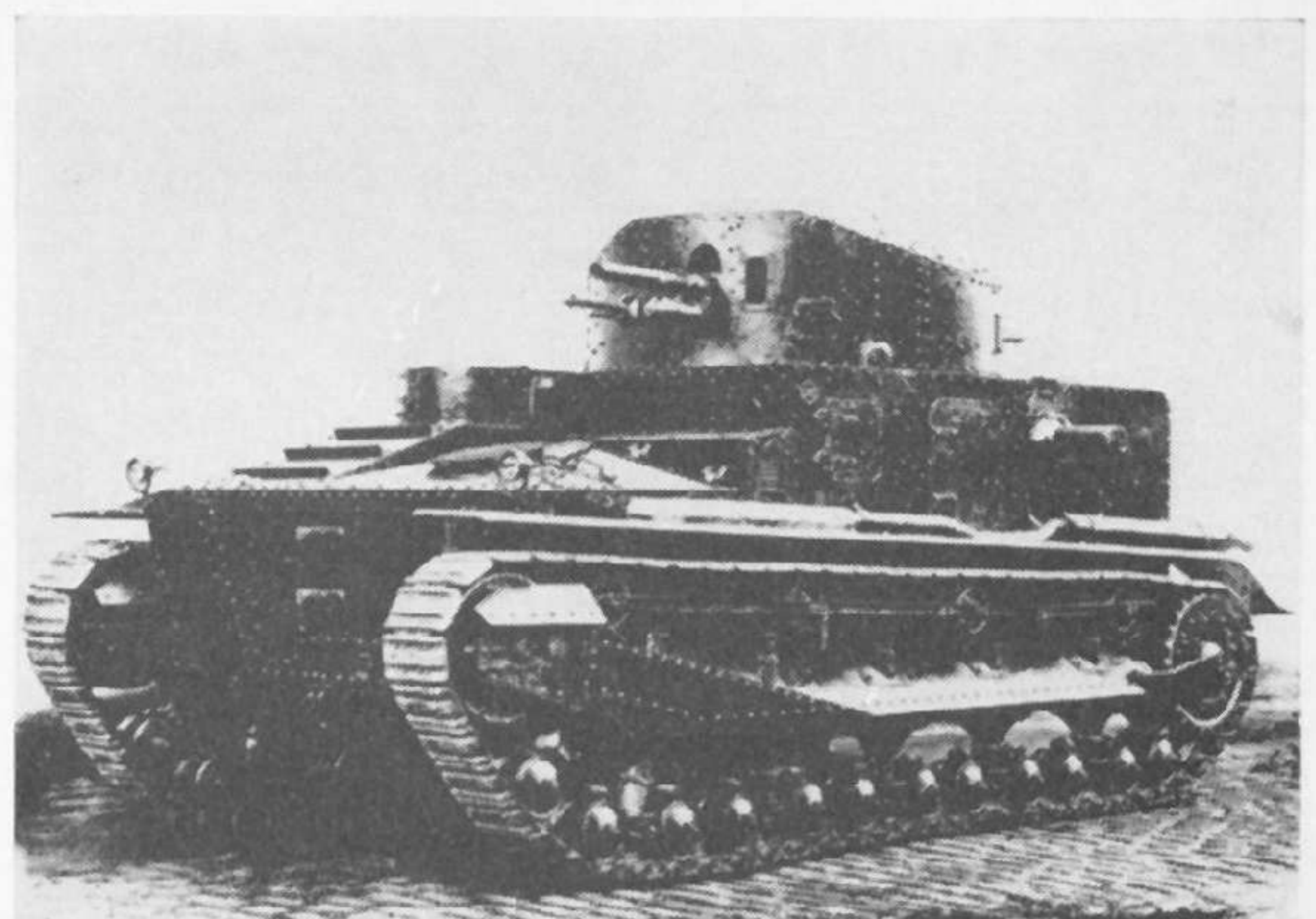
This Mark I, the only one to be so modified, was fitted with a Ricardo diesel 90-h.p. engine. Note cooler beside number plate and also box bogies in place of early open type.

(R.A.C. Tank Museum)





Mark IA with coaxial Vickers machine-gun and absence of Hotchkiss mountings. Note also command post and box bogies. The lead counterweight can be seen at the back of the turret.*
(R.A.C. Tank Museum)



Mark IA of 1924 with open suspension bogies. Two of the turret Hotchkiss guns can be seen and one of the side Vickers machine-guns, as well as the 3-pdr.
(R.A.C. Tank Museum)

Rollers on a floating brake drum were forced up inclined planes cut on the circumference of the epicyclic gear carrier: in so doing they released the pressure on the compressor levers and so allowed the epicyclic gear to revolve idly on itself—the tank then turned towards the side on which there was no drive to the tracks.

Mark II appeared with the 3-pdr. and 4 Hotchkiss MGs in the turret, the fourth in a bevelled back plate for AA work. The two side VMGs were also retained in this Mark, which weighed $\frac{3}{4}$ ton more than Mark IA with a consequent reduction in speed to 13 m.p.h. The additional weight coupled with the jerkiness of the Rackham clutches made them appear sluggish in comparison with the Mark Is and IAs whose designed road speed was 15 m.p.h. A properly maintained tank in the hands of a good driver could comfortably exceed this speed and the fastest Mark I, the C.O.'s tank of the 2nd Battalion, RTC, was on many occasions timed at 25 m.p.h. on good going.

MARK II★ MEDIUM TANK

This was the Mark II modified by the addition of a coaxial VMG in the turret, the abolition of all Hotchkiss MGs, and the addition of a commander's post situated further back than in the Mark IA★ which thus removed the commander's stomach from too close a proximity for comfort to the shells ejected from the semi-automatic breech block of the 3-pdr.

MARK IIA MEDIUM TANK

This version was produced in 1930 and 20 were built by Vickers. The 3-pdr. and the Vickers machine-gun were coaxial, and there was a command post cupola as in the Mark II★. But the bevel was removed from the rear of the turret, and on the port side, just forward of the side door, an electrically operated ventilating fan was protected by an armoured box whose top rose above the superstructure.

MARK II★★ MEDIUM TANK

During 1932 work was begun on converting 44 Medium Mark IIs by fitting coaxial mountings, a command post cupola on the turret roof, and an armoured container for a wireless set at the back of the turret. With this wireless bulge attached the tanks were designated Mark II★★—the wireless bulge being indicated by the second star.†

MEDIUM MARK II TROPICAL

Five Mark II tanks which had been specially modified and fitted to meet tropical conditions were sent to Egypt in 1928. The chief modifications were sun screens of woven asbestos fitted outside the upper surfaces and sides of the tank with an air gap of an inch to an inch and a half between the sheeting and the armour plate, and insulation of the Rackham steering clutches and control levers.

MARK IIA CS MEDIUM TANK

As the possibilities of independent tank action revealed themselves, a need arose for cover by smoke and possibly for the assistance of shells to cover the advance of the assaulting tanks. To provide this the main armament in Mark IIA Medium tanks was replaced by a 3.7 in. mortar firing a 15-lb. shell. This was principally used to provide smoke cover behind which manoeuvre could take place unobserved by the enemy. The range of smoke shell was about 1,000 yards. A certain number of HE shells were also carried although there was no means of ensuring the accurate application of HE fire to the target other than the time-honoured formula of "cock her up a bit more and you should be about right"! These Close Support tanks were provided on a scale of two for each company headquarters.

†There is evidence to show that there was also a Mark IIA★ which was a Mark IIA with an armoured wireless container fitted to the back of the turret. A photograph of one in difficulties in a tank trap appears on a later page—Editor.

VICKERS MEDIUM TANK VARIATIONS

The Vickers Medium tank was widely used: it was the first practical tank in production in 1923 and it offered reasonable offensive power and protection at the time it appeared. Vickers were prepared to make almost any variation the purchaser required and both the Medium IA and II appeared in many differing guises. It is not possible to list them all but among the more interesting are the following varieties:

Medium I Wheel and Track, 1926

To overcome track wear rubber-tyred wheels, the front pair steerable, were mounted on sub-frames at the front and back of the tank. These frames could be forced down by power driven jacks so that the wheels took the load and the track was clear of the ground. The rear wheels could be driven and although the tank was in a state of unstable equilibrium, it could move on roads looking, as one observer described it, "rather like a house perched on a very inadequate roller skate". After trials the wheels were removed and the tank was used in its normal state.

Medium II Bridgecarrier, 1927/1928

Bridge girders to construct an 18 foot bridge capable of carrying a medium tank were attached to the sides of a Mark II. A series of experiments to devise a method of launching the completed bridge, which was to be assembled by the crew near the scene of action, were instituted but never achieved success.

Medium II Female, 1927

Two of these tanks were built for the Indian Government following successful trials of Medium IIs carried out under the command of (the then) Lieut. J. T. Crocker. No main armament was mounted but ball mountings were provided for four VMGs in the turret, a lay-out closely resembling that of the Crossley armoured car turret.†

Medium II Box Tank, 1928

This vehicle was built as an experiment to give a battalion commander better facilities for exercising command in the field than he normally had in a tank. A box body was fitted on a Medium Mark II chassis without any armament save for one machine-gun which was also available, if needed, for dismounted use. It was much appreciated by battalion commanders but really came into its own with the Tank Brigade in 1931: fitted with two wireless sets it was used by the Brigade Commander and was really the predecessor of the wheeled Armoured Command Vehicles which were used so much during World War II.

Medium Mark II* Special, 1929

Australia ordered four of these machines which had the coaxial VMG on the left of the 3-pdr. and a

†Although generally known as Medium Mark II Female their correct designation is Tank Light Mark IA Special (L) India because they were never actually re-classified as Medium.—Editor.

Mark II with coaxial Vickers machine-gun and armoured command post on turret roof. The cupola was officially described as a "Bishop's Mitre", from its shape when open—as in this photograph. Note base for wireless aerial at corner of turret. Tracks are No. 3 pattern with recesses in the plate.* (Imperial War Museum)



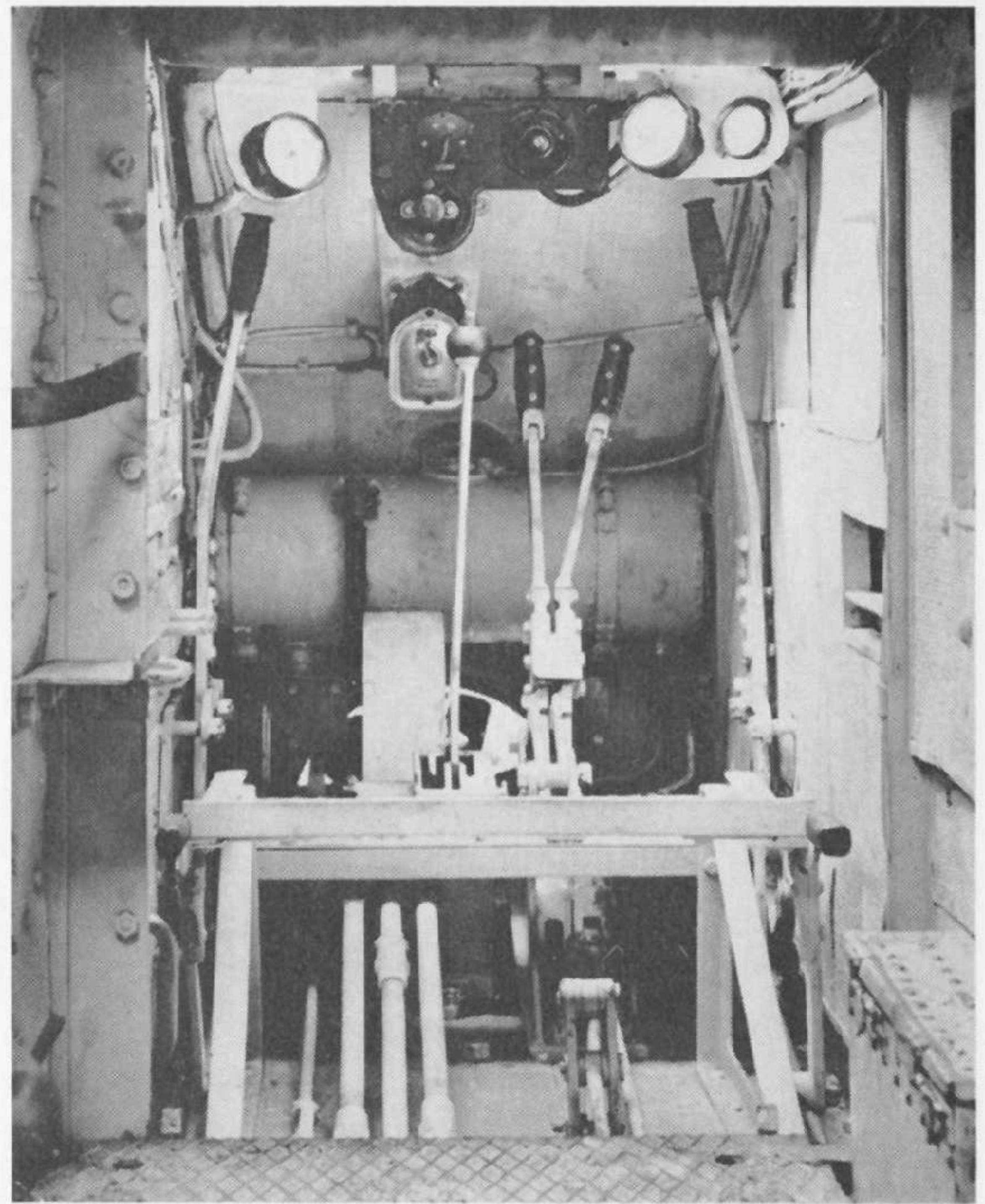


Mark II. Note driver's hood proud of superstructure, one of the recognition points of all Mark IIs and variants. This vehicle was later converted to a Mark II. The tracks are No. 1 pattern without recesses in the plates.* (R.A.C. Tank Museum)

separate VMG in a ball mounting on the right hand side of the turret.

Medium Mark II* Command Tank, 1931

This was a Mark II tank with the 3-pdr. removed and replaced with a dummy gun made of wood. The alteration was carried out to provide a command tank for the Tank Brigade in 1931. Two wireless sets were mounted in the turret which could not be revolved.



Driver's compartment in Medium Marks II, IIA, and II.* (Imperial War Museum)

VICKERS MEDIUM C TANK

This was a post-war prototype and bears no relation to the Medium C built in 1918-1919 by Messrs. Foster of Lincoln. This tank was based on the Medium II chassis and weighed 11 tons. It was powered by a

110 h.p. water-cooled engine, a striking departure from current thought, and used the normal transmission of the standard medium tank. The turret was considerably larger than usual and was extended to the rear to accommodate a VMG in a ball mounting firing at 180 degrees to the main armament which had

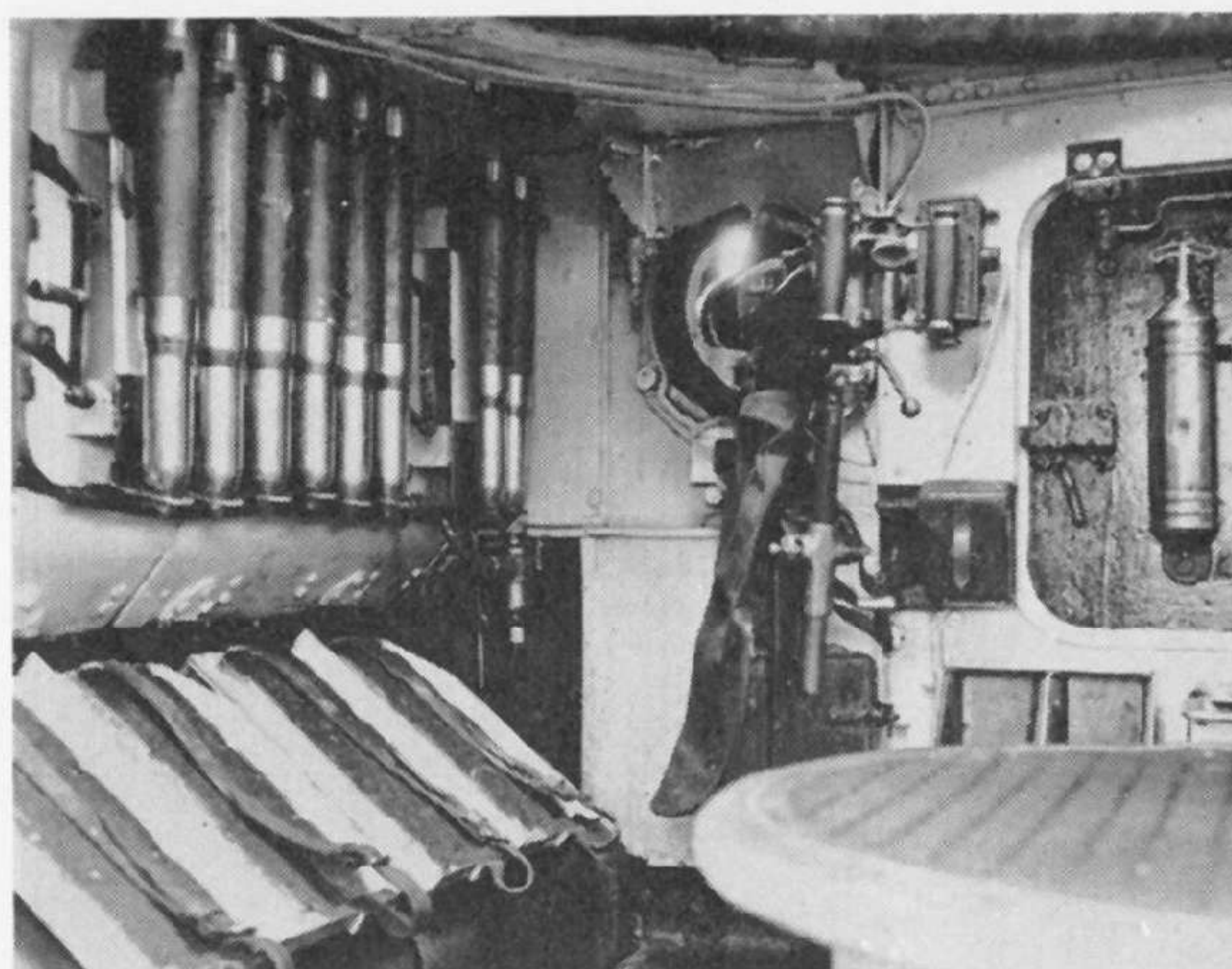
Side view of Mark II with cupola closed. Note skirting protecting bogies, a feature common to all Mark IIs and variants. In the background a Light Tank Mark IV.* (Imperial War Museum)



been increased to a 6-pdr. gun. The tank had a bow VMG and also carried one in each side, better positioned than in the standard mediums. This interesting modification was only produced in prototype form. The increase in calibre and the change to a water-cooled engine differentiate it sharply from the current run of tanks.

THE MEDIUM TANK CHASSIS AND THE ARTILLERY

The medium tank chassis was also used as a basis for a series of vehicles intended to tow guns of varying calibres. They proved fairly satisfactory, having a good performance across country and a satisfactory draw bar pull. They were never produced on a lavish scale but were followed successively by the Light Dragons which were evolved from the light tank chassis and later by the four-wheeled towing vehicle used so extensively from 1939 onwards. Three Birch guns with an 18-pdr. mounted on a tank chassis were also produced between 1926 and 1929 but never developed beyond the prototype stage. It was a great pity that it was not possible to overcome the radical change in the handling of artillery that their use would have involved. Self-propelled guns as such did not come into general use until American tank chassis were available for the purpose.



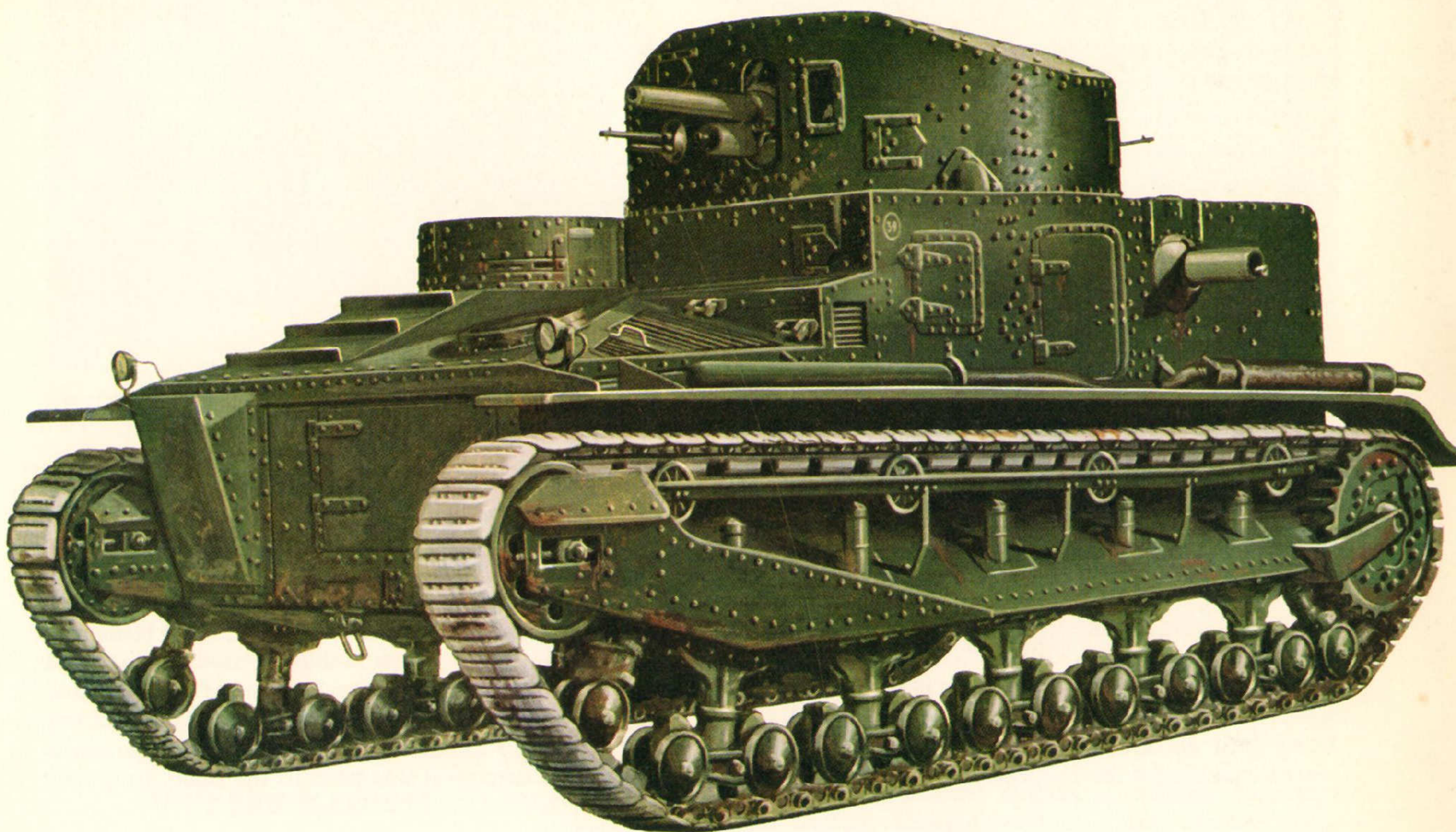
Interior of Medium Mark II showing left side Vickers machine-gun aft of door and 3-pdr. rounds. (Imperial War Museum)

BRITISH MAIN AND SECONDARY ARMAMENTS

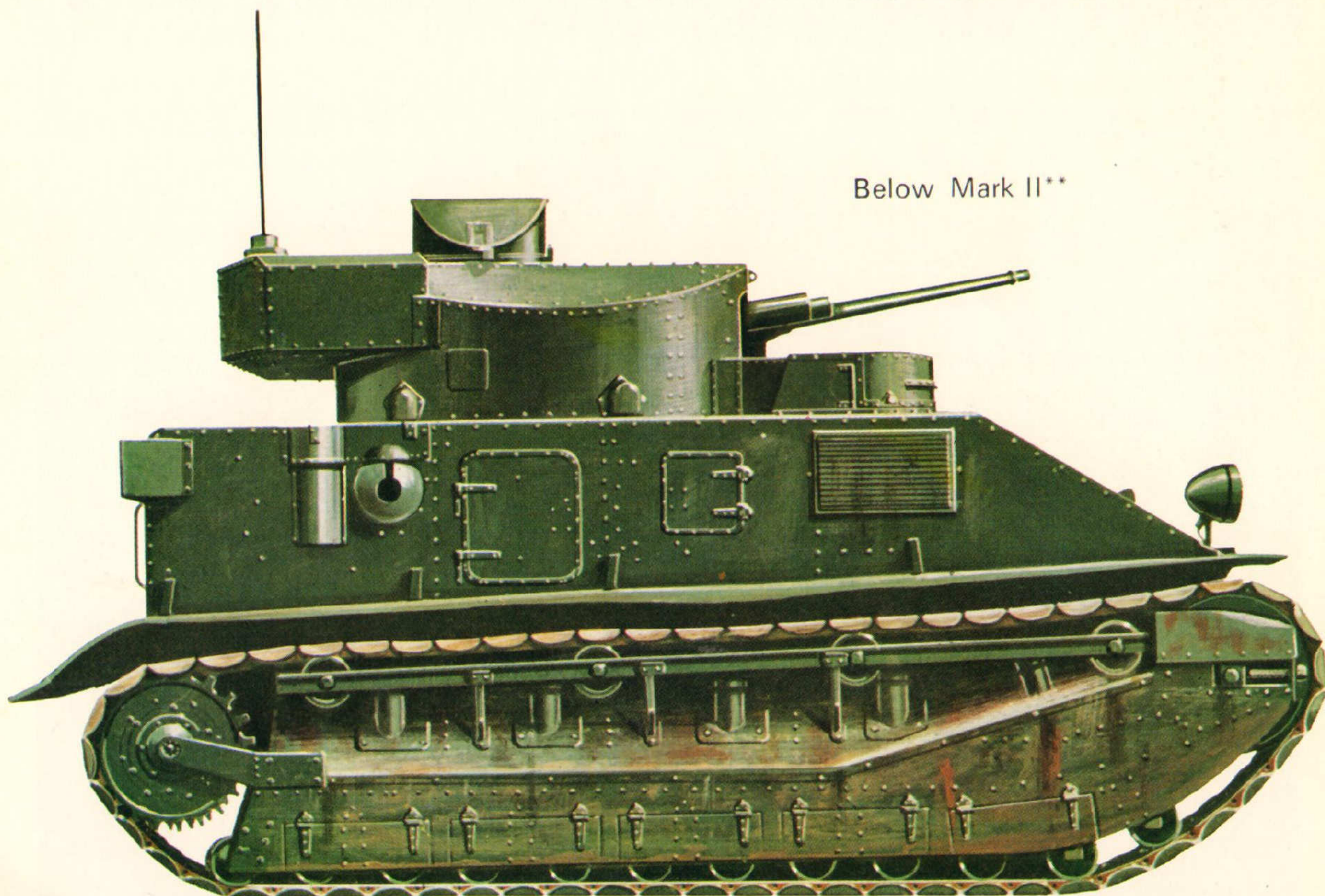
All the Medium tanks so far described bristled with machine-guns—heavy ones at that, for the Hotchkiss light machine-gun which had been used by the Tank Corps in the war disappeared in favour of the water-cooled version which became the standard tank gun and was later specially adapted for tank use. Comparatively little attention was paid to the main armament

Mark IIA, showing the armoured box which protected the electrically operated ventilating fan on the port side just forward of the side door. Mark IIA had the "Bishop's Mitre" and coaxial Vickers machine-gun like the Mark II.* (R.A.C. Tank Museum)

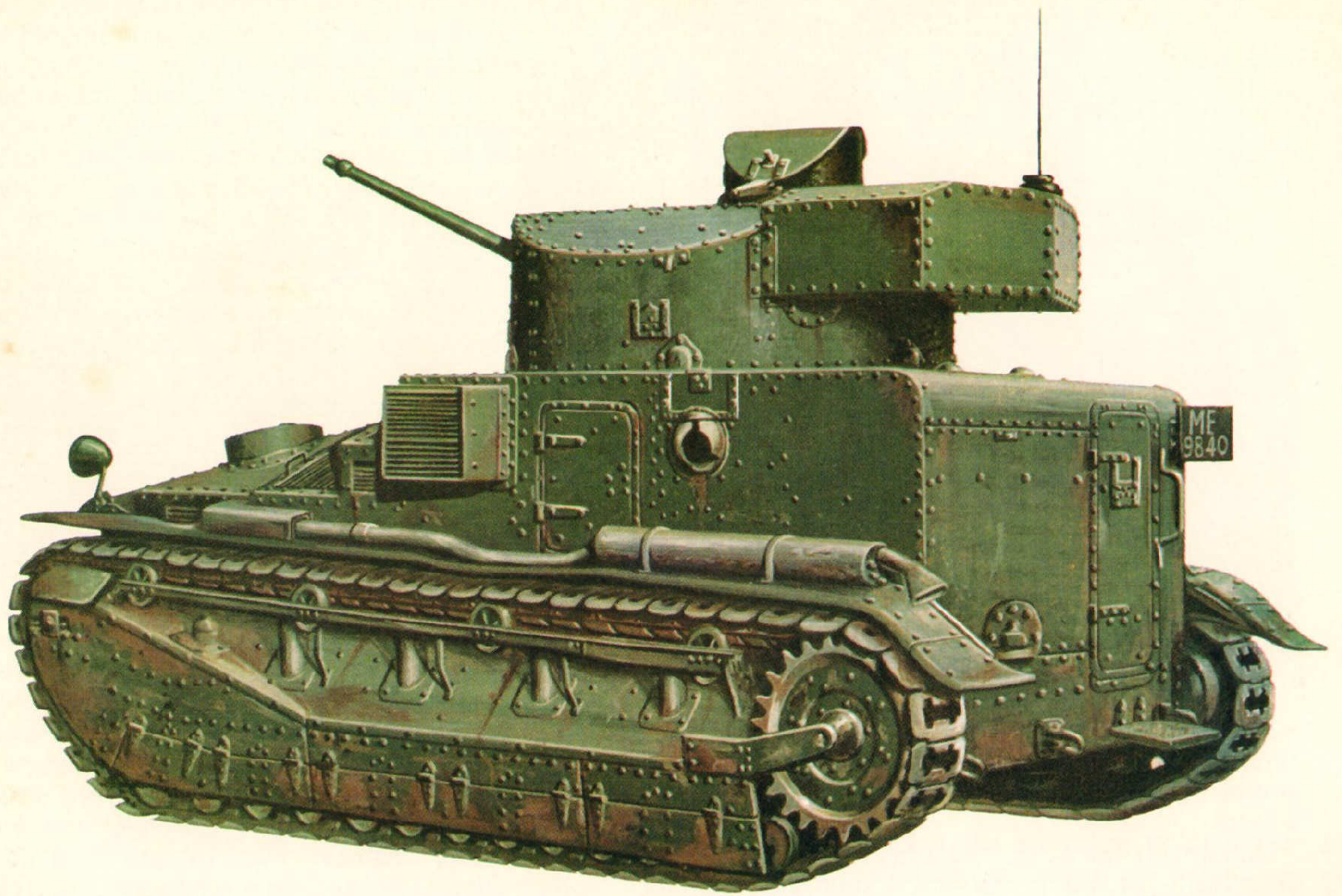




Above Mark IA

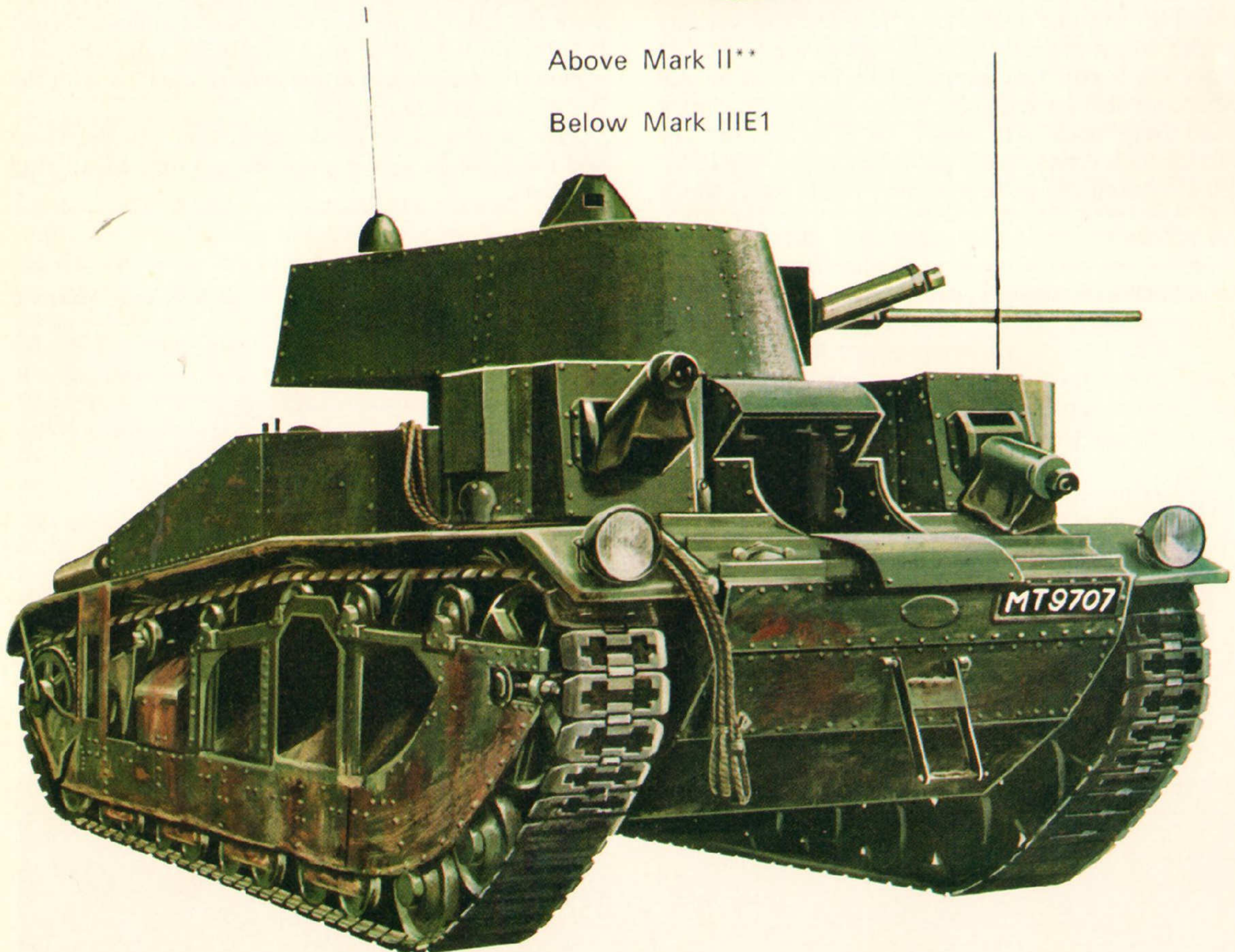


Below Mark II**



Above Mark II**

Below Mark IIIE1





Interior of Mark IIA showing coaxial mountings and ventilating fan.
(Imperial War Museum)

which was a 3-pdr. from 1923 to 1939 when it was replaced by a 2-pdr. with the sole exception of the prototype Vickers Medium C which would have had a 6-pdr.

Admittedly the 2-pdr. had a higher muzzle velocity than the 3-pdr. but it was only a shot-firing weapon backed up to some degree by a very few low velocity mortars whose primary function was to fire smoke. In theory the 3-pdr. was supposed to fire both an AP round and also an HE shell, whose explosive content would have been very small. In practice, and for practice, tank crews fired a flat-headed sand-filled shot with a reduced charge to minimize barrel wear, which

upset all the range drum figures. This lamentable state of affairs was due to the failure to realize that hostile tanks must be a tank's primary target and that until they are destroyed or driven off unarmoured troops are particularly vulnerable. In current military thought at the time, outside the RTC, the tank's principal task was considered to be the destruction of hostile MG and anti-tank gun crews by fire—hence the insistence upon the machine-gun which was considered enough for this task and could also cover the infantry on to their objective. The main armament of British tanks was increased in size and weight very slowly during the War and there was never a period in which the British tank gun was definitely superior to the guns of the tanks that it was opposing. It was not until 1951 that the 20-pdr. in the Sherman assured a British tank of gun superiority over any comparable tank in the world both in the AP and HE rôle.

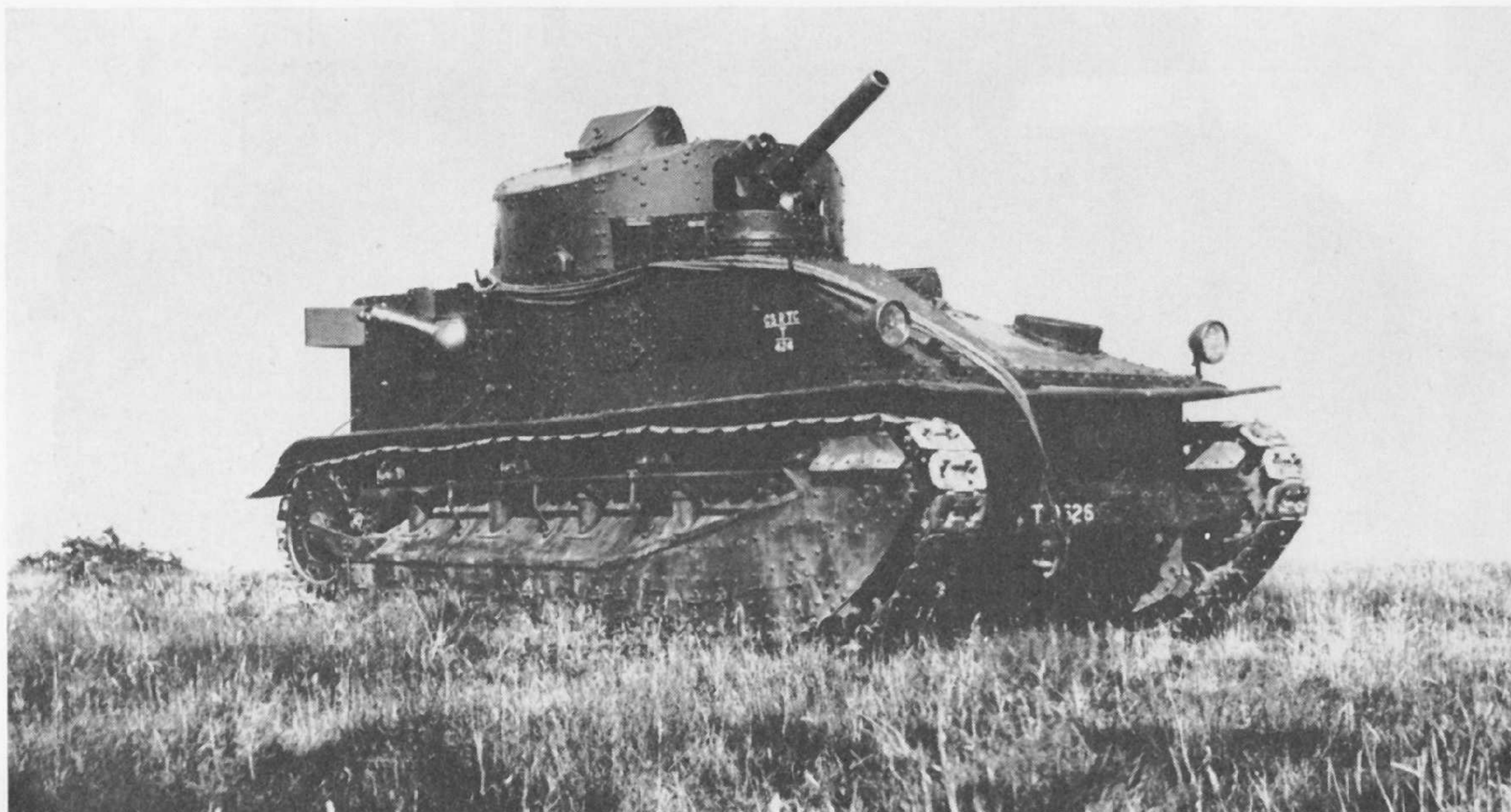
PART TWO 1926—1937

The medium tanks built during this period were experimental and none ever went into service. They are interesting because they indicate the general trend of tank design at the time and they were all, to a greater or lesser degree, influenced by the Independent tank. This was a heavy machine and only one was ever built: it incorporated some very good features, notably the fighting chamber with its provision for the observation of fire and the machine-gun turrets which were arranged at the four corners of the main turret; in addition the power train was again relegated to a separate compartment at the back of the tank with the fuel stored outside the hull.

Four classes of medium tanks come into this story and the table on a later page sets out their identifying numbers.

Mark IIA CS with mortar in place of 3-pdr.

(R.A.C. Tank Museum)





Mark II A CS. Note driver's hood open, with vizor divided in two and top hinged back—an arrangement common to all Mark IIs and variants. Because of Britain's tank shortage in 1940, especially after the fall of France, Mediums were brought back into service with operational units for a time. The tanks in this photograph, taken in England in autumn 1940, are probably of C Squadron, 3rd. Royal Tanks, part of 1st. Armoured Brigade, 2nd. Armoured Division, which sailed for the Middle East in November of that year.

(Imperial War Museum)

A6—THE 16 TONNER

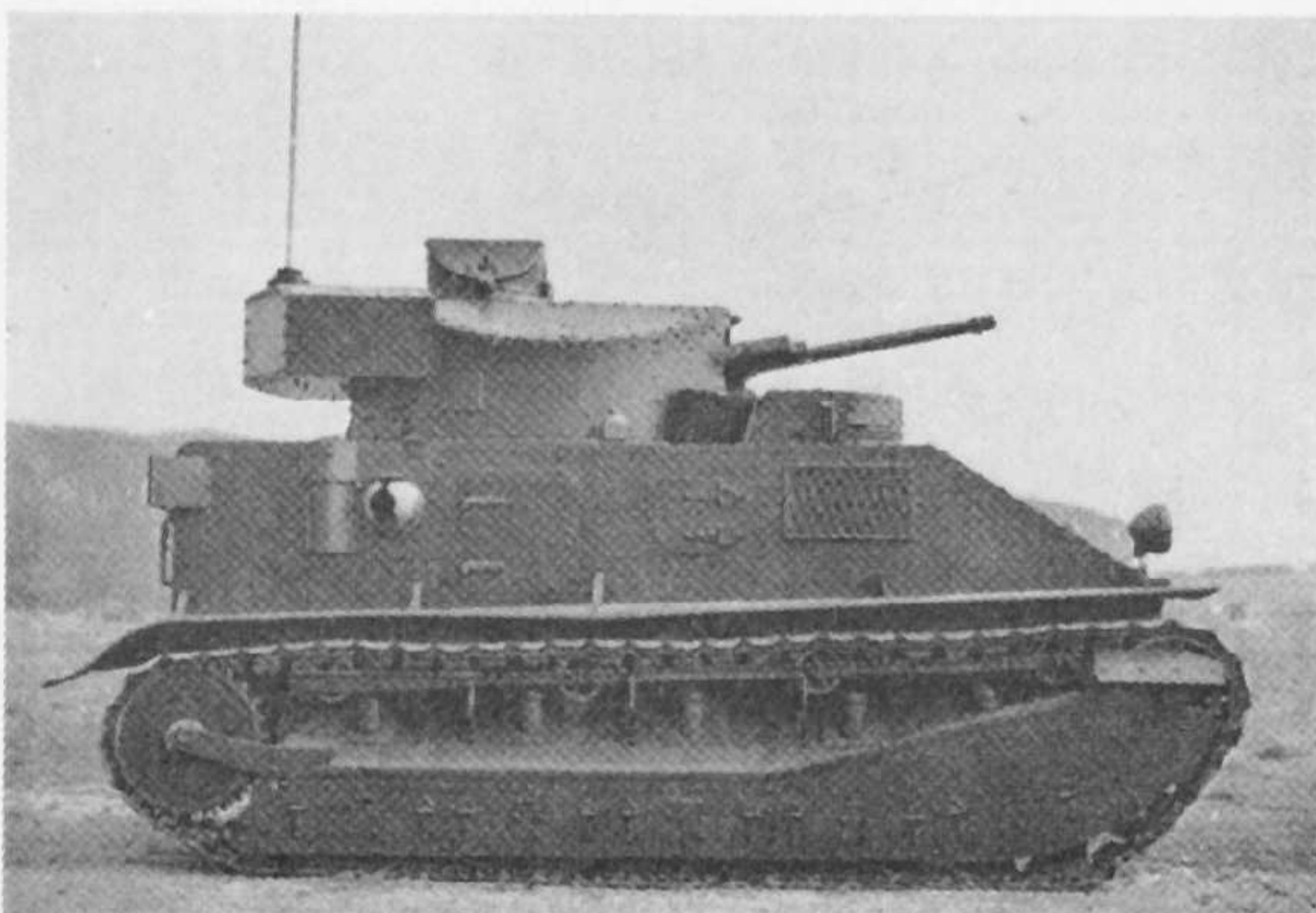
The procedure for the procurement of a tank shows its evolution from an idea to a running machine, and although the A6s never went into service they did play a considerable part in the development of later machines especially as far as suspension was concerned.

In May 1926 when the Vickers Mediums had been in service for some time, the Royal Tank Corps Centre were asked to forward their views on the improvements required to increase the mechanical and fighting efficiency in a new medium tank. The user was not normally given the chance to express his views in detail before the construction of a new machine but where this procedure was adopted, as for the A6 and the Independent, the results were most satisfactory. The RTCC report, which was completed by July 1926, and the general specification for the new tank which

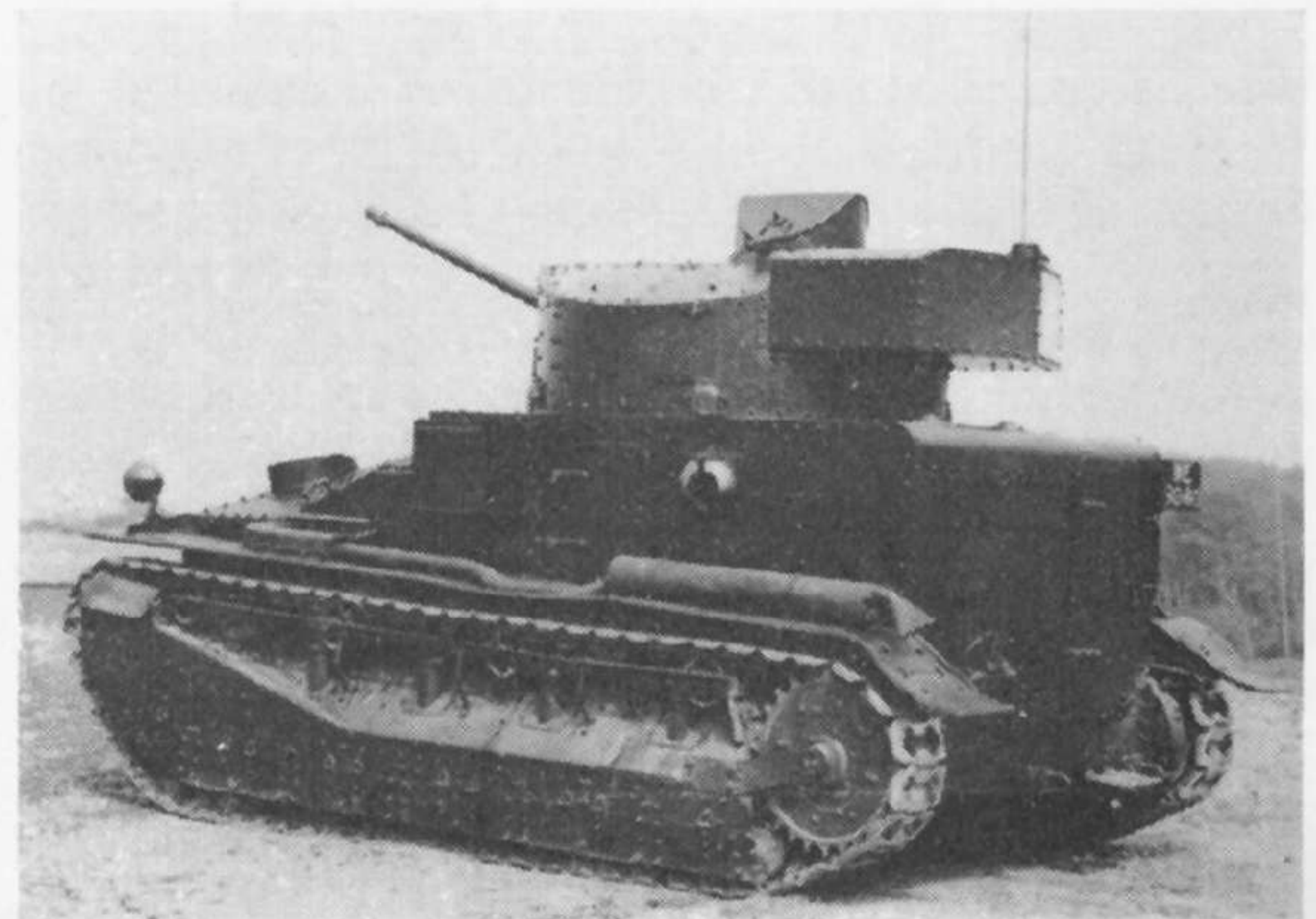
was based on it, listed the following points: Two machine-gun turrets were needed and the weight was not to exceed 15½ tons. The tank was to be capable of transport by rail and was to be as simple in design and as accessible as possible. The radius of action for lubricating oil was to equal that for fuel—the Vickers Mediums were notorious offenders in this respect even after larger oil tanks had been installed. Wireless was to be developed and installed and the main armament should penetrate comparable hostile tanks at a range of 1,000 yards. Fuel tanks were to be outside the hull, and front and belly armour must provide protection when crests were crossed. Particular emphasis was laid on silence—experiments with rubber tracks and wheel rims had shown promise.

This outline specification was forwarded to Vickers-Armstrong who were also given instructions to build A6, a tank which should incorporate the points laid

*Side view of Mark II** showing wireless bulge at back of turret. (R.A.C. Tank Museum)*



*Three-quarter rear view of Mark II** with wireless bulge. (R.A.C. Tank Museum)*



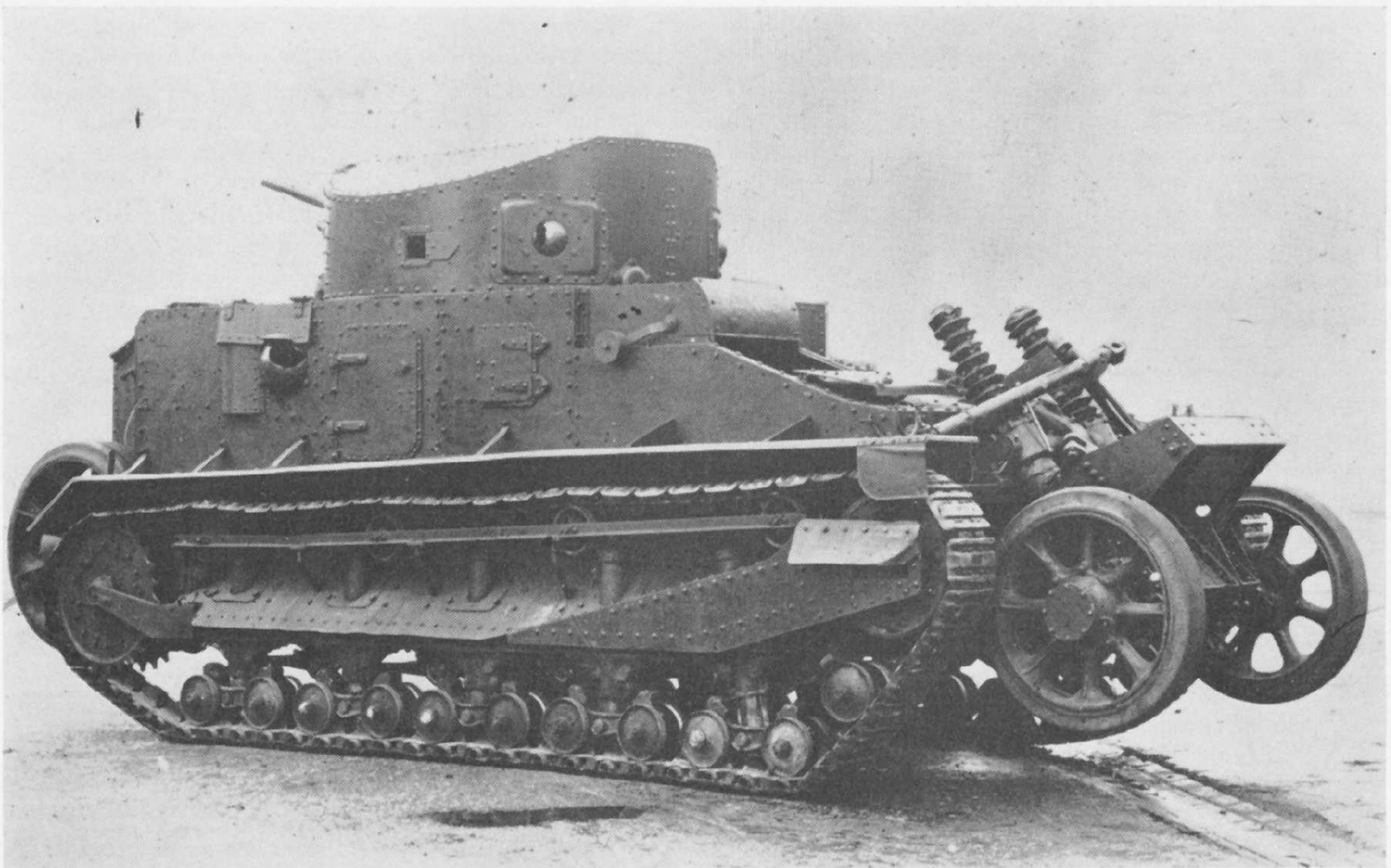


Mark IIA* in difficulties—caught in a pit dug by sappers to test tank stopping techniques.

(Imperial War Museum)

VICKERS MEDIUM TANKS 1921–26

Type	Weight tons	Length	Width	Height	Engine	Max speed m.p.h.	Radius Miles	Armament Main	Machine-guns	Armour mm. max/min	Crew	Remarks
Vickers Light Infantry								1 × 3-pdr.	3 × .303 Hotchkiss			
Medium Mk I	11.7	17'6"	9'1½"	9'3"	Armstrong Siddeley V8 90 b.h.p. air-cooled	15	120	1 × 3-pdr.	4 × .303 Hotchkiss 2 × .303 Vickers	6.25/-	5	
Medium Mk IA	11.9	17'6"	9'1½"	8'10½"	Armstrong Siddeley V8 90 b.h.p. air-cooled	15	120	1 × 3-pdr.	4 × .303 Hotchkiss 2 × .303 Vickers	8/6.25	5	Bevelled back plate to turret for AA Hotchkiss
Medium Mk IA*	11.9 12.1	17'6"	9'1½"	9'10½"	Armstrong Siddeley V8 90 b.h.p. air-cooled	15	120	1 × 3-pdr.	3 × .303 Vickers	6.25/- 8/6.25	5	One Vickers machine-gun mounted coaxially with 3-pdr.
Medium Mk II	13.2	17'6"	9'1½"	8'10"	Armstrong Siddeley V8 90 b.h.p. air-cooled	15	120	1 × 3-pdr.	4 × .303 Hotchkiss 2 × .303 Vickers	8/6.25	5	
Medium Mk II*	13.5	17'6"	9'1½"	10'0"	Armstrong Siddeley V8 90 b.h.p. air-cooled	15	120	1 × 3-pdr.	3 × .303 Vickers	8/6.25	5	One Vickers mounted coaxially with 3-pdr. Mk II** had a wireless bulge fitted to turret
Medium Mk II ACS	14.0	17'6"	9'1½"	10'0"	Armstrong Siddeley V8 90 b.h.p. air-cooled	15	120	1 × 3.7 Howitzer	3 × Vickers machine-guns	8/6.25	5	Mk IIA* had a wireless bulge fitted to turret
Vickers Medium C	11.6	18'4"	8'4"	8'0"	6-cyl. 110 b.h.p. water-cooled	20	125	1 × 6-pdr.	4 × Vickers machine-guns	6.5/-	5	Prototype only. No coaxial machine-gun



Experimental Wheel and Track Medium Mark I. Three-quarter front view showing wheels raised. Turret is reversed. This tank has an experimental driver's hood.
(Imperial War Museum)

down. The firm were given a free hand over the lay-out although preference was expressed for a separate rear engine compartment: also an improvement in steering by comparison with the Medium tanks was required and owing to the limitations imposed by bridging equipment the frontal armour could not exceed 13 mm. with 9 mm. elsewhere on the tank.

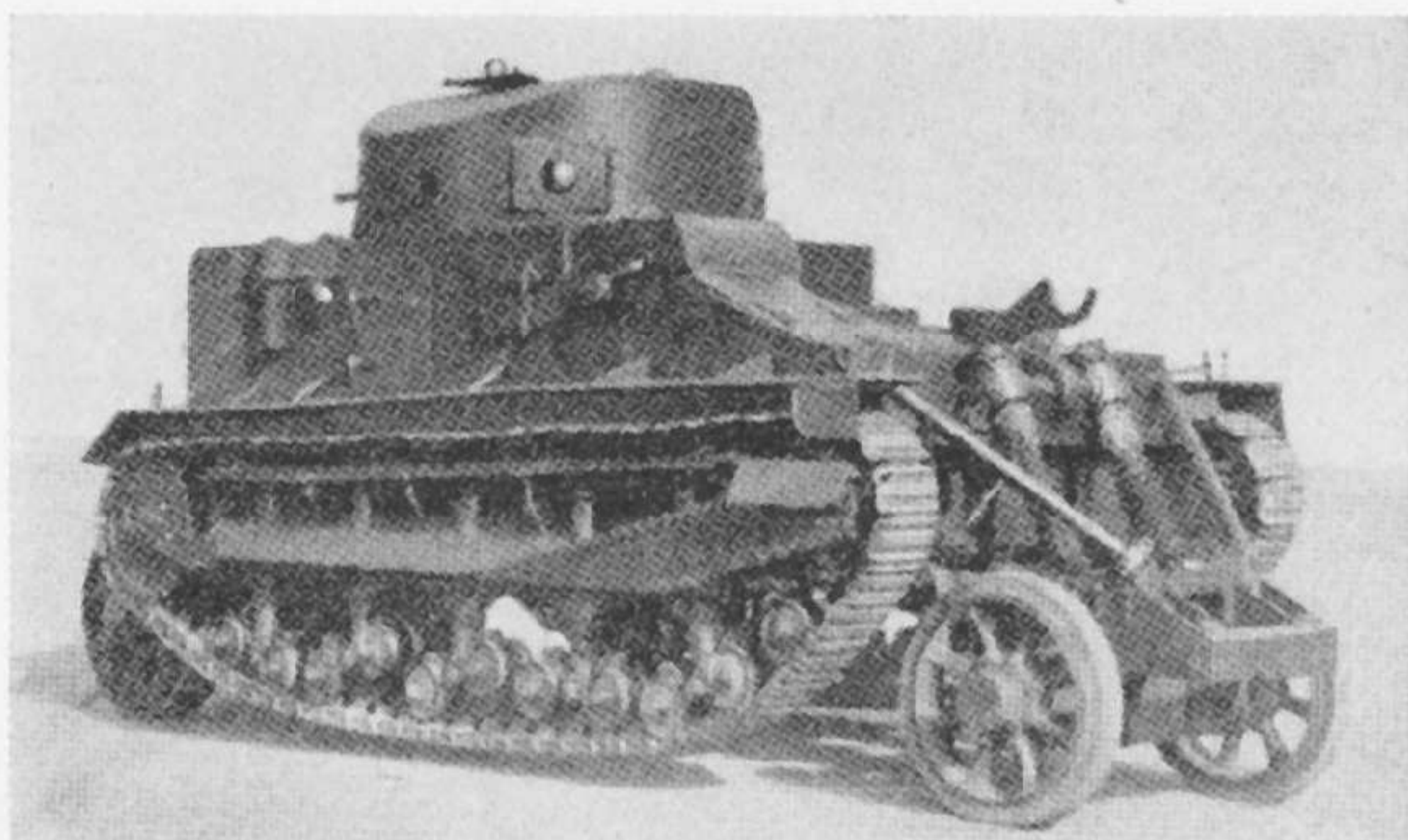
These instructions to Vickers were followed by another most interesting letter from the War Office which set out three classes of tanks as possible future requirements,

- a. The Big Tank—a battle tank.
- b. A light tank—to protect troops going into battle and for exploitation.
- c. A two-man tank—possibly on the lines of the Morris Martel for reconnaissance duties.

By September 1926 Vickers Armstrong had pro-

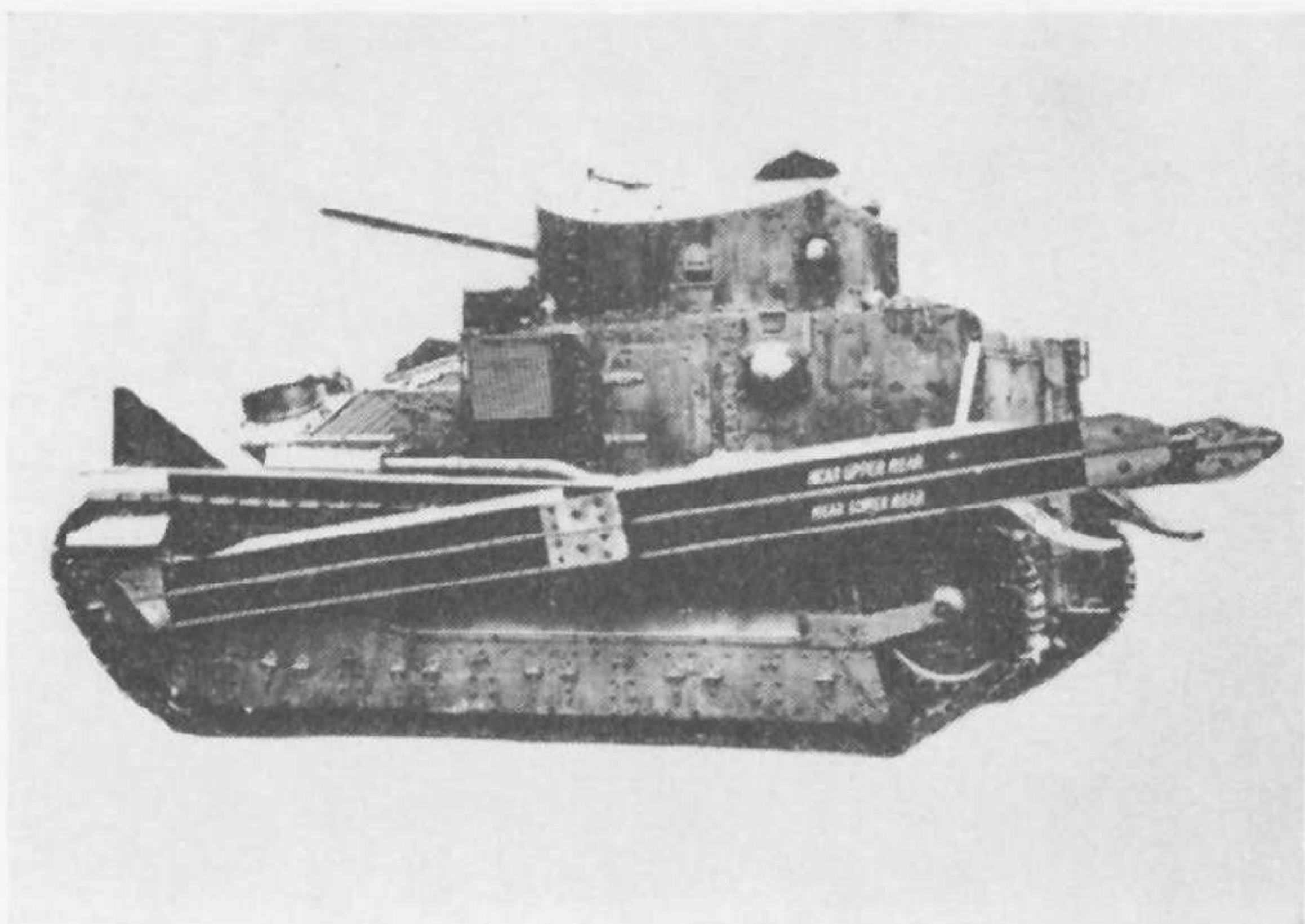
Experimental Wheel and Track Medium Mark I with wheels lowered and tracks clear of the ground.

(R.A.C. Tank Museum)



duced an outline of their proposals: the new tank was to be built on the lines of the Independent with a fighting chamber in front and the power train housed separately in rear. The main turret with the 3-pdr. and a coaxial MG would have all round traverse with special facilities for the commander and the observer for observation. (The observer appears in both the Independent and the A6s and Medium IIIs: he would have been valuable even in those days of little obscurity and much more so had it been possible to include him as muzzle velocities became higher: on the other hand the cost, in terms of weight of the additional armour needed to house him, would have upset other factors, weight, power etc, and reduced the tank's performance.) The new tank was to have two machine-gun turrets, each with twin Vickers, and a third MG turret behind the main one was to house an AA MG. Armour was to be on a 13 and 6½ mm. basis and the estimated weight would be about 14 tons. 120 gallons of fuel were to be carried, 110 in outside tanks on the running boards and the rest in a gravity tank inside the tank. At the estimated weight a 120 h.p. engine would give 14 m.p.h. and 180 would be needed to attain 20 m.p.h.

A mock-up was ready for inspection by March 1927 and was approved, Vickers being given orders for a second A6 which was to be fitted with a different gearbox, hydraulically operated and incorporating epicyclic gears. The two tanks were completed and sent to the Mechanized Warfare Experimental Establishment for trials by June 1928, a remarkably short time for the building of a new vehicle. An interesting point arose over the insistence on skirting plates. Vickers felt that they would be unable to provide



Mark II Bridgecarrier fitted with girders.
(R.A.C. Tank Museum)

these within the weight limitation but they were told that they must be provided even at the cost of an adjustment of armour elsewhere on the tank.

Power units

The Armstrong Siddeley V8 180 h.p. engine was substantially the same as that fitted to the Vickers Mediums. It was an air-cooled unit with steel cylinders and shrouded in similar fashion for cooling. A6E2 was fitted with a Ricardo CI engine of nominal 180 h.p., but it proved unsatisfactory and the original AS engine was replaced in the tank. A6E3 which originally

appeared with an AS 180 h.p. air-cooled engine was later re-engined with a 500 h.p. Thorneycroft 6-cylinder unit: this was a slow speed motor originally intended for nautical use but it performed well under trial as a tank engine and ran a total distance of 500 miles.

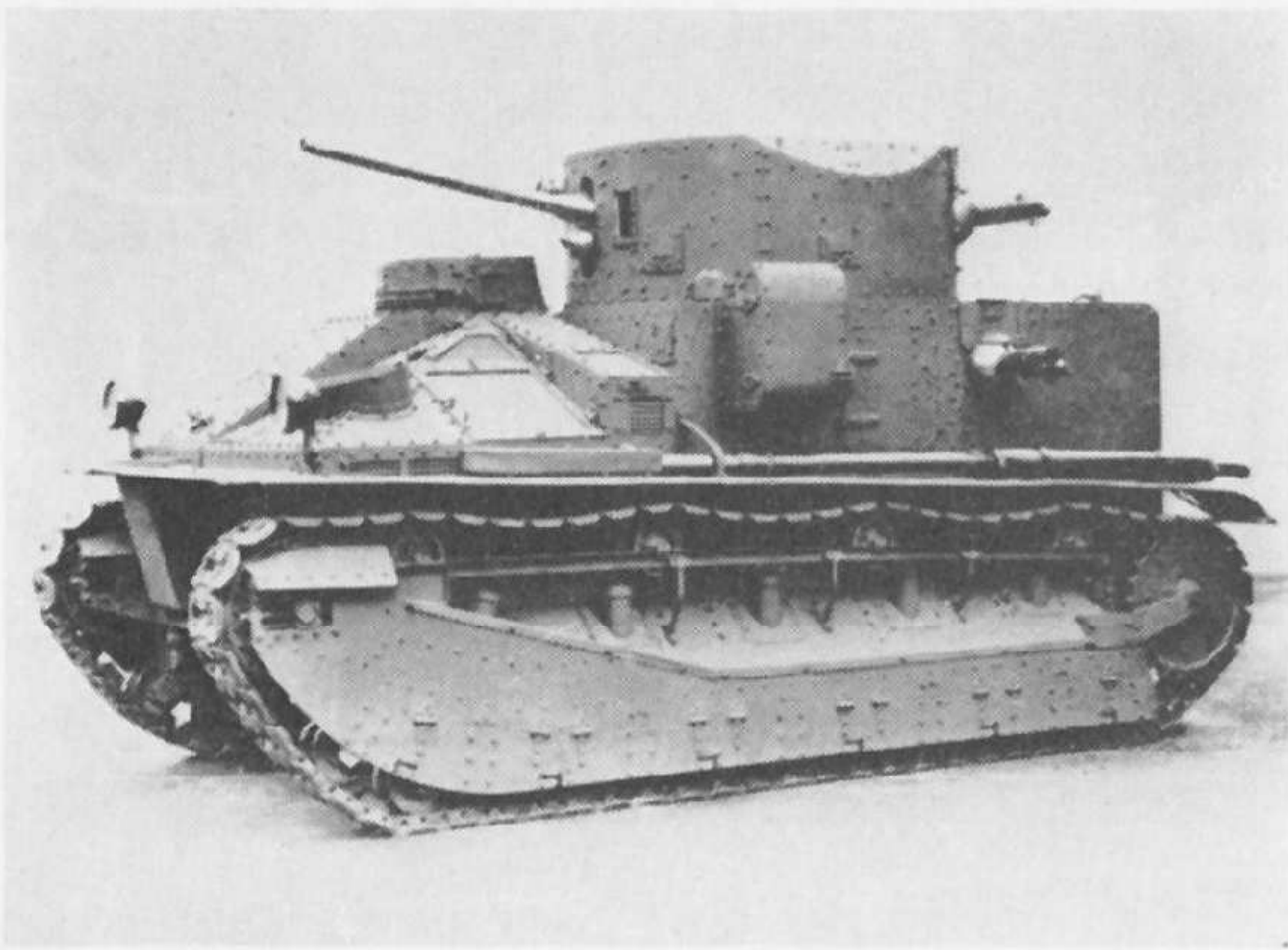
A suggestion was put forward that the AS engine on A6E1 should be replaced by two Rolls-Royce/Phantom engines, coupled as one unit. A Wilson hydraulic gearbox and Wilson epicyclic steering units were also specified, but since this virtually involved a complete rebuild of the tank the proposal was abandoned on account of cost. In retrospect it is a pity that the idea came to nothing: it might have solved the problem of adequate horse power for tank engines which has always bedevilled our tank designers. The comparison with contemporary American tanks which were then using aircraft engines adapted for ground work is an interesting one.

Gunnery

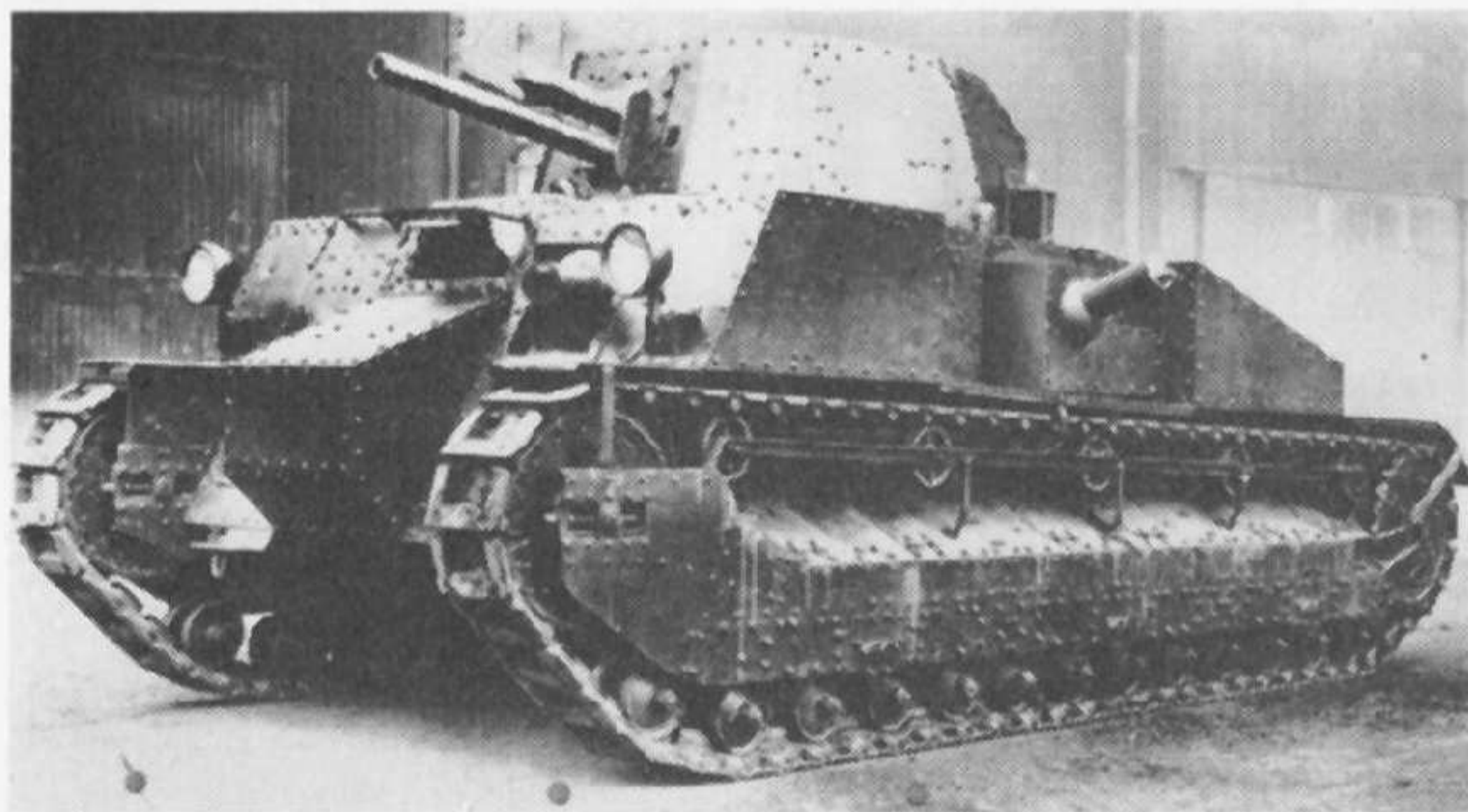
In July 1928 an A6 was sent to Lulworth for gunnery trials: the machine-gun turrets proved unsatisfactory in use and a new pattern based on the Independent MG turret was designed and approved. This was fitted to A6E3, then building at Sheffield. Quite apart from the MG turrets, the general gunnery installation on the A6 was not considered satisfactory, not even as good as that on the Medium II. To bring the A6s up to date with current gunnery practice would have in-

Brigadier (later Lieut-General Sir Charles) Broad commanding "1st. Brigade, Royal Tank Corps" from the Mark II Command Box Tank during brigade exercises on Salisbury Plain, September 1931.
(R.A.C. Tank Museum)



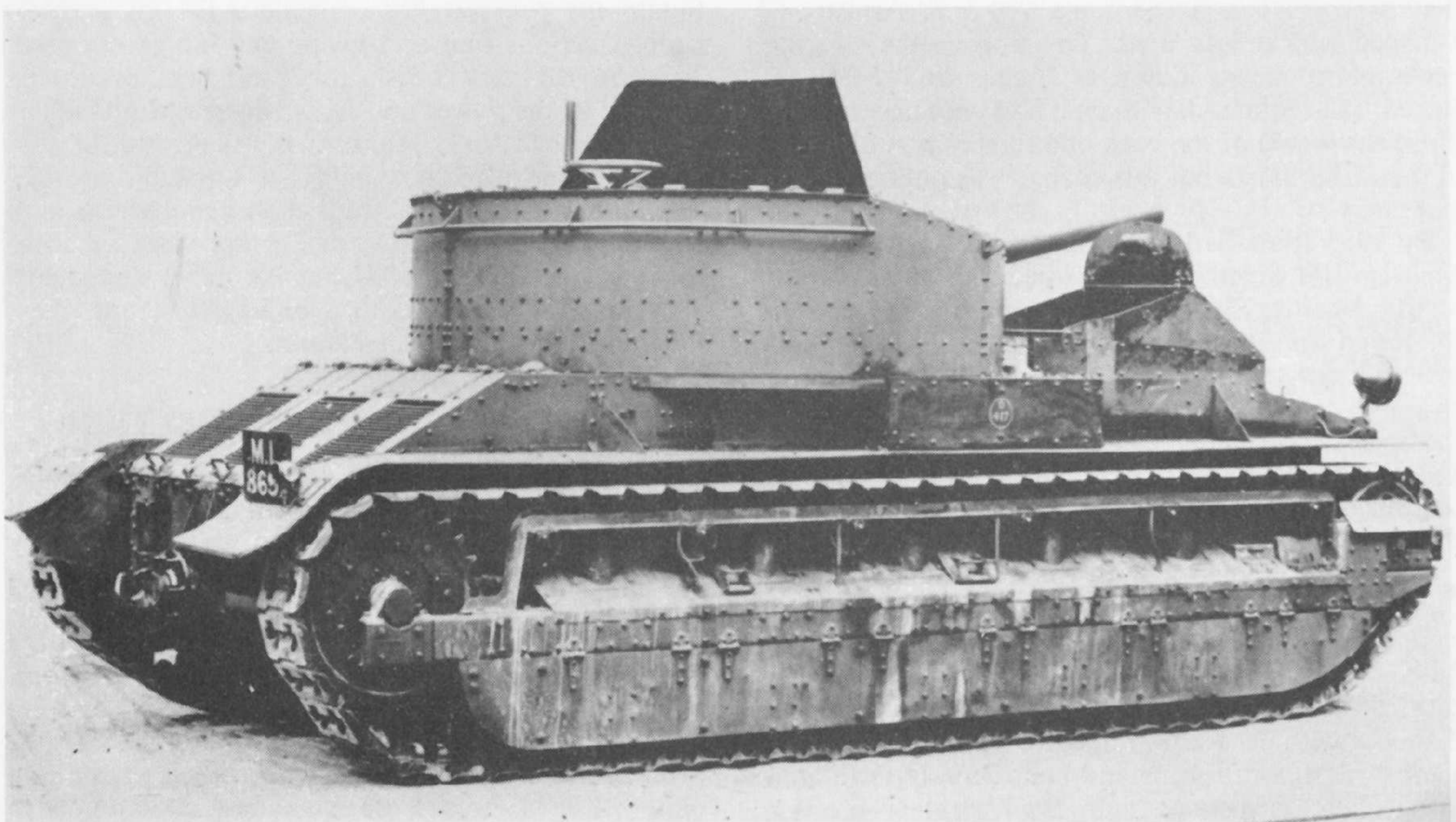


Mark II special model built for Russia in 1931 with independently mounted Vickers machine-guns in the turret. Basically this "English Workman" was a Mark IIA, but without command post on turret.
(R.A.C. Tank Museum)



Vickers Medium C, pilot model built for Japan, with 6-pdr. as main armament and bow machine-gun as well as side machine-guns and another in rear of turret. Engine was in rear. Bulkheads and outside fuel tanks were to reduce fire risk. Eire also bought Medium C.
(R.A.C. Tank Museum)

Birch gun, Mark I, 1929 pattern, mounting an 18-pdr. After the Gun Carrier tanks of the First World War the Birch was the first SP gun.
(Imperial War Museum)



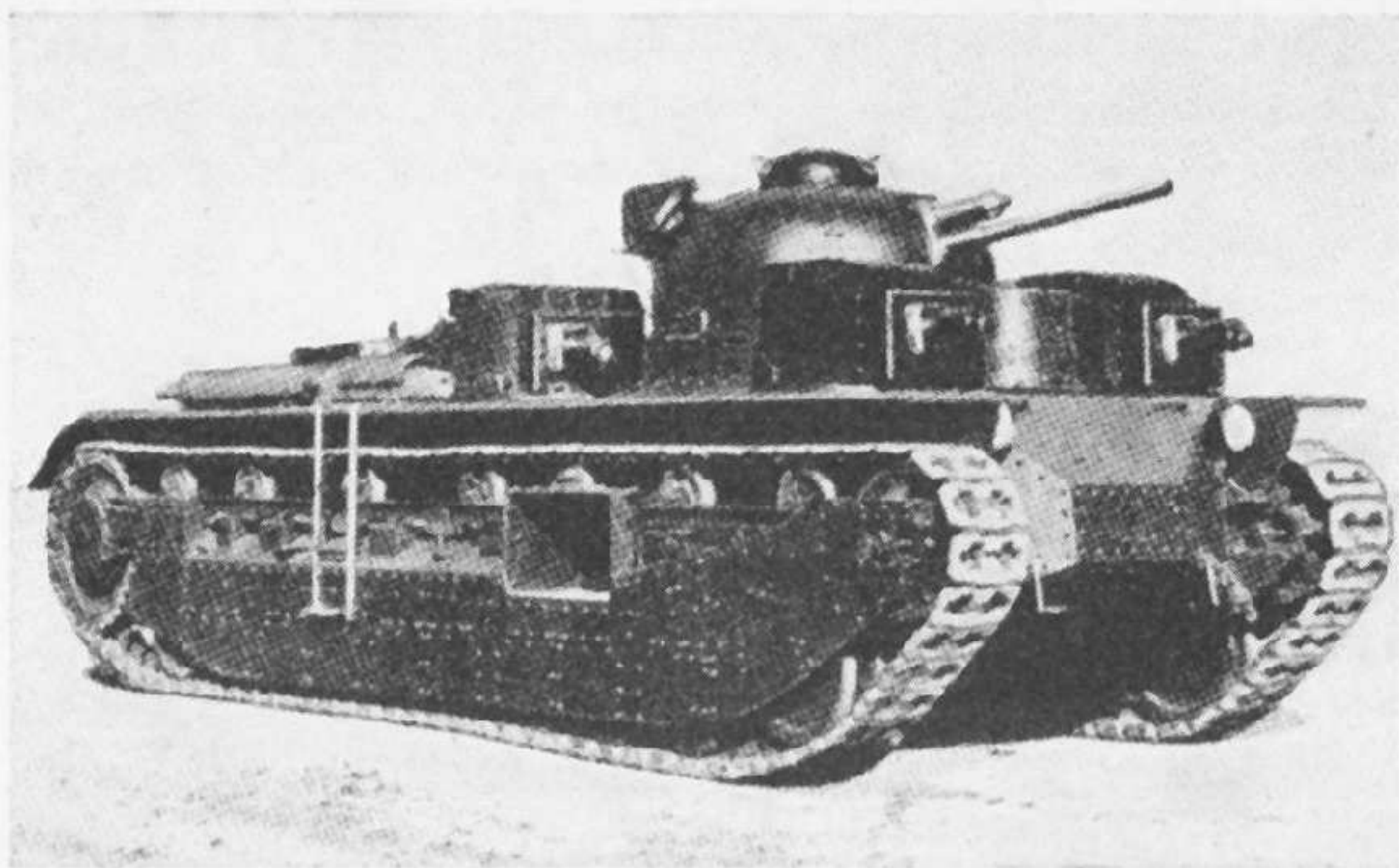
volved a considerable amount of redesign: it was therefore decided to keep the A6s for automotive trials and experiments and to concentrate attention on the gunnery installation in the Medium IIIs which were building at the time.

Suspension

Accurate firing on the move was a tactical requirement for tanks in the early '30s and a stable gun platform was therefore a prime necessity. The Medium II suspension had proved unsatisfactory in this respect and the A6s were considered even worse after the gunnery trials at Lulworth. In 1929 Vickers-Armstrong produced three new alternative designs, two of which could be exchanged with existing suspension units, but the third, which weighed 5 cwt, involved structural alterations to the vehicle. It was decided that A6E3 should be modified to take this last pattern, the others being fitted to E1 and E2. None proved satisfactory and all were subject to excessive bumping on the front bogies. Various modifications, including shock absorbers, both single and double acting, and stronger springs to both main and inclined bogies, were suggested and tried with only partial success. In 1934 entirely new suspension units, built by a firm specialising in this type of work, proved satisfactory. The contrast between the time taken to build the tank and the time needed to finalise modifications is striking, even allowing for financial stringency and the lack of urgency over completion, and vividly illustrates the lengthy nature of development trials.

THE MEDIUM MARK III

In 1928 it was decided to build a new medium tank based on the A6. The general lay-out and external appearance were the same except for the turrets which



The Independent, which had considerable influence on tank design in several countries. Four of its five turrets can be seen in this view. (Vickers-Armstrong)

were quite different. A6 appeared with a conical turret, having two mushroom-shaped cupolas perched at the back, one for the commander and one for the observer. By the time that A6E3 appeared these had been changed to a single cupola. No wireless bulge was fitted to any of these tanks. The Medium III turret retained the sloping sides of the A6 but there resemblance ceased. The front plate was flattened for the gun mantlet and the rear of the turret was extended to form a wireless bulge big enough to take a No. 9 set. Single-gun MG turrets were fitted and the front of these turrets was again flatter than in the A6, presenting an unbroken front with the driver's visor right across the front of the tank. A command post was located at the back of the turret. The MG turrets had a 36 in. ring with geared traverse and shoulder control for elevation. They were set a little further forward than in the A6 in order to get the centre of gravity of the whole tank further forward. In the A6 it had been only just in front of the centre of length, which was considered likely to affect cross-country performance.

The mechanical layout of the Medium III was like that of the A6 and the same 180 h.p. Armstrong Siddeley engine was used. To improve the steering performance larger diameter brakes had been designed: to accommodate them it had been necessary to move the whole of the back end further forward than in the earlier tanks but this change was not noticeable externally.

By 1933 trials had been completed on two of the Medium IIIs which had performed well on roads and on good going. The automotive performance was up to design specification and the gunnery trials had proved satisfactory. On rough going the story was not so good: the suspension was still unsatisfactory with the bogies "bottoming" over obstacles or rough going. The third Medium III was fitted with a modified suspension which showed some improvement over the other patterns.

On the whole the Medium IIIs proved satisfactory: they were used by HQ The Tank Brigade in 1934 and were easy to handle, reliable, and considerably better than the Medium Mark II both for comfort and for ease of maintenance. Little further use was made of them but with the A6 they had provided the answer to a lot of design problems and considerably facilitated the production of later high speed tanks. There is a

curiously close parallel with the NbFz of the Germans which looked very like the Medium III and was never issued to troops or brought into production. The significant point of difference between the two lies in the armament—a 3-pdr (47 mm.) as against a 75 or a 105-mm. gun.

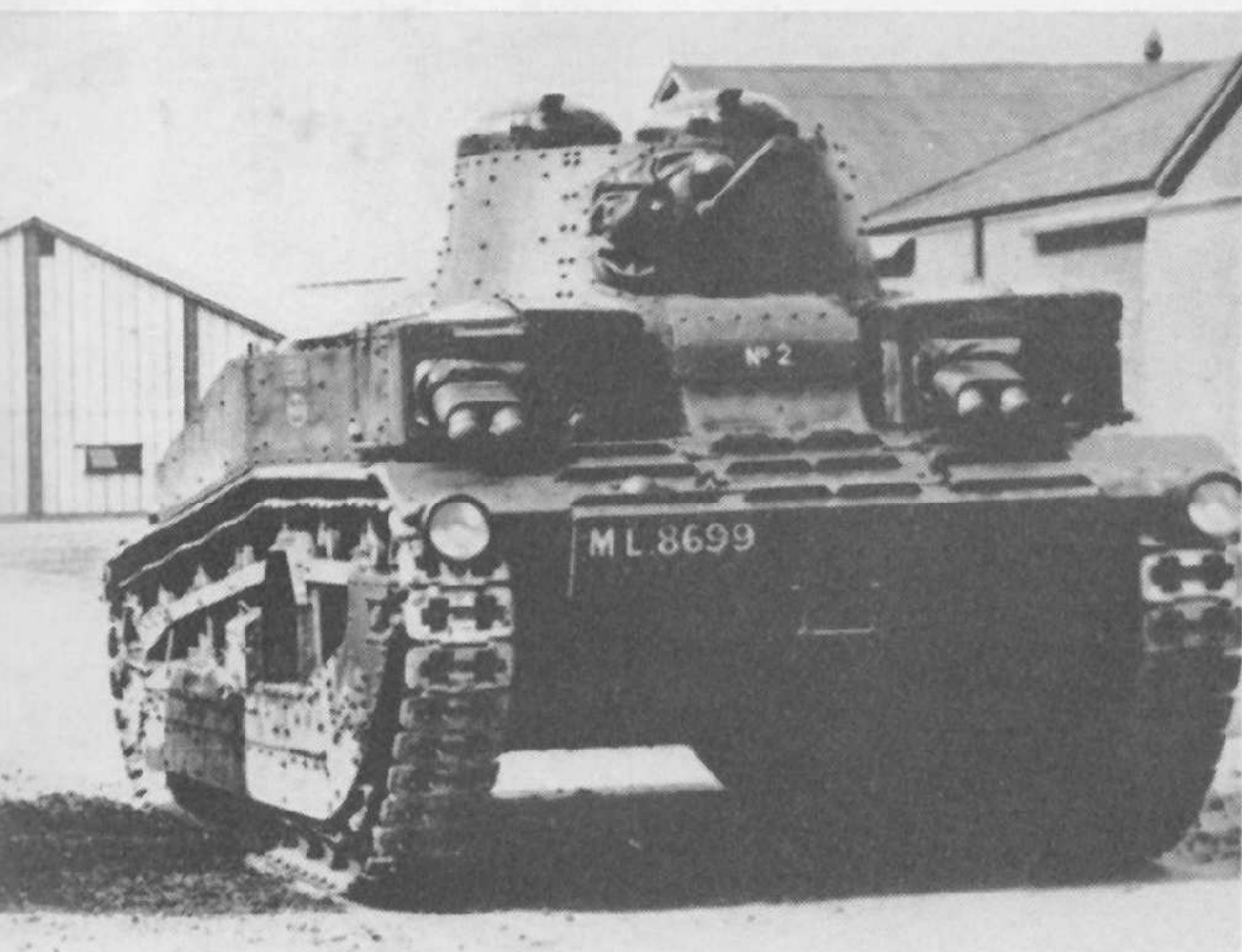
A7—THE 14 TONNER

In external appearance these tanks are a complete departure from their predecessors. They were conceived as a cheaper machine, carrying the same armament but without the complications of the separate MG turrets. Design began in 1928 and by the end of 1929 A7E1 and A7E2 had been completed by the Royal Ordnance Factory at Woolwich. Externally the top run of the track was straight, with no less than seven return rollers: a continuous mud chute was provided all along the upper part of the track, and the two separate machine-gun turrets had disappeared and been replaced by a single Vickers MG in the vertical front plate, housed in a gimbal mounting alongside the driver. Both tanks were powered by the Armstrong Siddeley 120 h.p. V8 air-cooled engine. E1 had a normal Armstrong Siddeley indirect drive 4-speed gearbox of the pattern fitted to the Medium IIIs, E2 had a Wilson hydraulically operated epicyclic box. Both tanks were fitted with modified epicyclic steering of the pattern fitted to the Medium III and these proved completely satisfactory once some minor trouble over brake-band linings had been overcome.

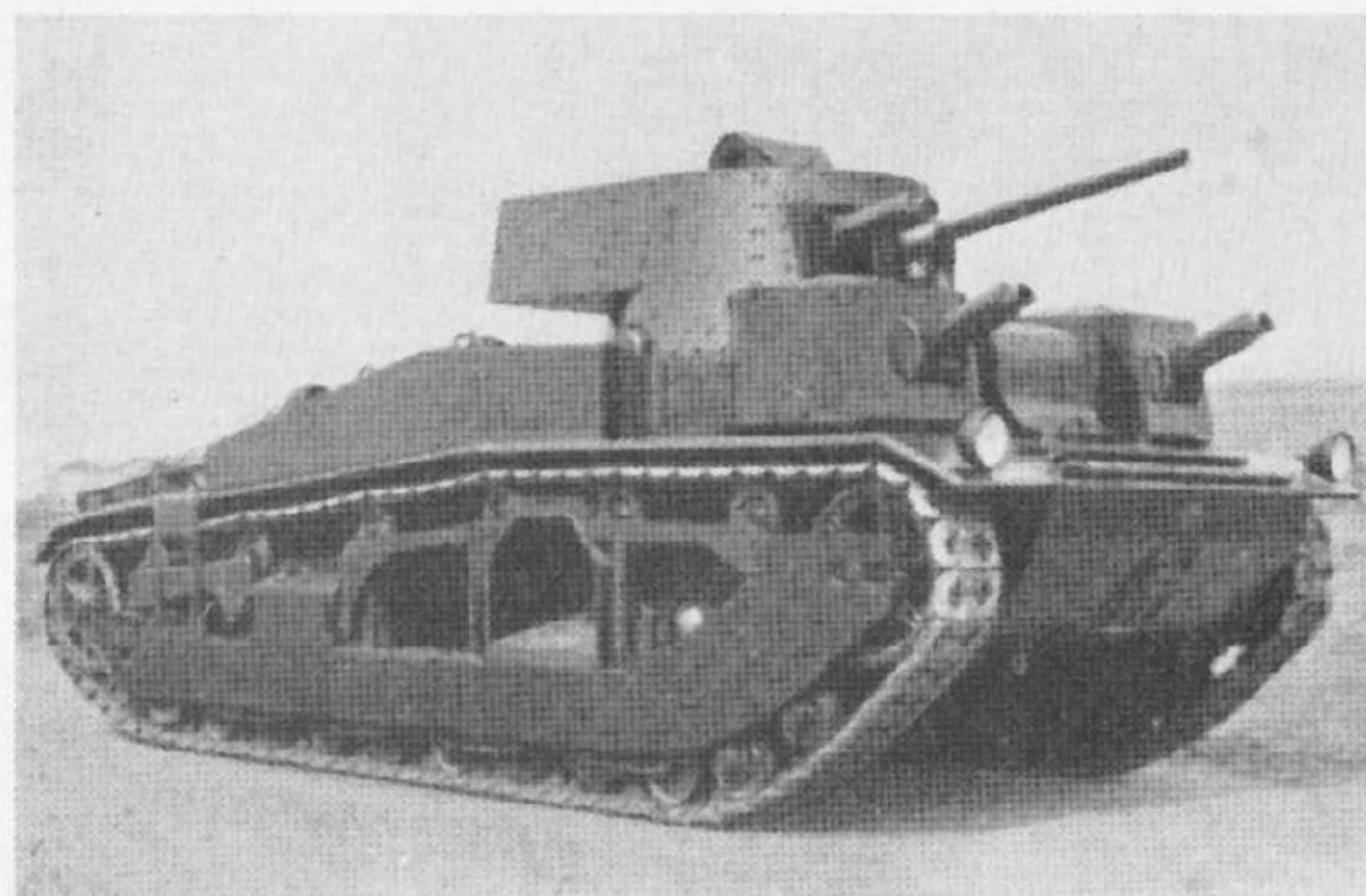
Suspension problems were still to the fore. E1 appeared with a compensated leaf springing assembly while E2 used single bogies with vertical volute springs. Comparative trials of suspensions were held in 1934 when A7E2 came off best but damaged all assemblies to a considerable extent in so doing. Sanction for the construction of A7E3 was given this same year and she appeared with trailing single wheel bogies fitted with helical coil springing. E3 was commissioned as a fast tank of medium weight and to obtain the necessary power twin AEC CI engines, coupled as one unit and giving 280 h.p., were used. This proved very satisfactory and was eventually adopted as the power unit for A12—the Matilda. The most unsatisfactory feature of the tank was the suspension which bumped badly at anything over 15 m.p.h., a fact confirmed on the Churchill which used the same type of suspension. Further work on these tanks was stopped in 1937 but the turret design was used in A9 and A10 with a redesigned front plate, incorporating an external mantlet.

A8—EXPERIMENTAL MEDIUM TANK

This tank never got beyond the drawing-board mock-up stage. It was the last experimental tank in the vital inter-war medium tank series and was conceived by Vickers-Armstrong as a successor to the Medium III. A wooden mock-up was built by July 1933 on the lines of the A7. It had virtually the same fighting chamber and the turret ring could take the A7 turret with the new 2-pdr. gun. Water-cooled engines were specified for this tank because it was felt that the problems of manufacturing an air-cooled engine of a pattern not in general use might prejudice supply in



A6E2 (the 16-tonner) showing twin Vickers machine-guns in sub-turrets which are set back from the front of the tank, and the twin cupolas on the turret.
(R.A.C. Tank Museum)

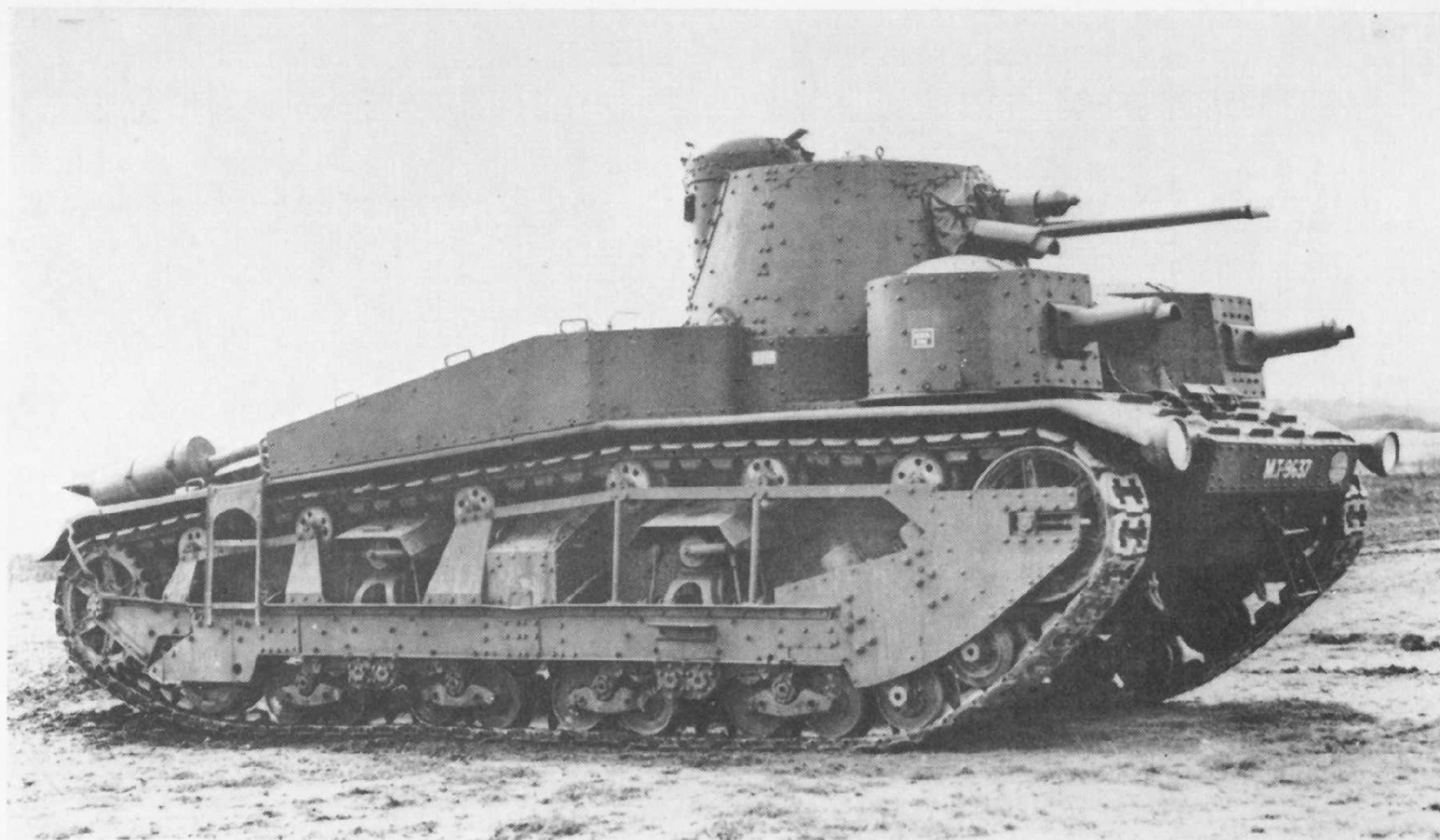


Vickers Medium Mark III with altered turret, command post, wireless bulge, and the two single machine-gun sub-turrets brought forward in line with the driver's visor.

(R.A.C. Tank Museum)

BRITISH MEDIUM TANKS 1926-37

Type	Weight tons	Length	Width	Height	Engine	Max speed m.p.h.	Radius Miles	Armament Main	Machine-guns	Armour mm. max/min	Crew	Remarks
A6 E1	16	21'6"	8'9"	9'2"	Armstrong Siddeley V8 180 h.p./1800 r.p.m. air-cooled	26	120	1 x 3-pdr.	6 x .303 Vickers	14/9	7	Sub turrets originally 2 machine-guns each: later changed to single guns 1928. 6th AA Machine-gun removed
A6 E2	16	21'6"	8'9"	9'2"	Armstrong Siddeley V8 180 h.p./1800 r.p.m. air-cooled	26	120	1 x 3-pdr.	3 x .303 Vickers	14/9	7	E2 fitted with Ricardo CI engine later replaced by Armstrong Siddeley 180 h.p. V8. Oil operated gearbox SLM (Winterthur) pattern. A6 E1 E2 delivered for trial June 1928
A6 E3	16½	21'6"	8'9"	9'2"	Armstrong Siddeley V8 180 h.p./1800 r.p.m. air-cooled	26	120	1 x 3-pdr.	3 x .303 Vickers	14/9	7	Fitted with new machine-gun turrets based on Independent tank pattern later fitted with 500 h.p. Thornycroft 6-cyl. engine
Medium III E1	16	21'6"	8'10"	9'8"	Armstrong Siddeley V8 180 h.p./1800 r.p.m. air-cooled	30	120	1 x 3-pdr.	3 x .303 Vickers	14/9	7	
E2, E3	16	21'6"	8'10"	9'8"	Armstrong Siddeley V8 180 h.p./1800 r.p.m. air-cooled	30	120	1 x 3-pdr.	3 x .303 Vickers	14/9	7	E2 destroyed by fire
A7 E1 E2	14	—	—	—	Armstrong Siddeley 120 h.p. air-cooled	25	120	1 x 3-pdr.	2 x .303 Vickers	14/9	5	A7 E2 turret modified to take 2-pdr gun. This pattern was to be fitted to A8
A7 E3	18.2	—	—	—	Twin AEC CI 6-cyl.: coupled to give 252 h.p.	25	—	—	—	14	5	A 12 Matilda infantry tank developed from this machine. Wilson epicyclic steering. Built of mild steel
A8	17.5	—	—	—	Twin Rolls Royce 6-cyl. engines. Wilson gearbox	—	—	—	—	—	—	Drawings and mock-up. Never completed in steel



A6E3 showing single Vickers machine-guns in the sub-turrets and the modified suspension.

(R.A.C. Tank Museum)

time of war. Vickers suggested twin Rolls-Royce engines coupled as a unit and driving a Wilson epicyclic gearbox and steering units.

Considerable doubts were expressed on the possibility of supplying Rolls-Royce car engines without interfering with the production of aero engines, even though the former were to be built in a separate factory. However in 1937 after parts of the drawings and the mock-up had been completed the project was abandoned because, except for the engine arrangement, A8 showed no significant advance over any of its predecessors.

A.F.V. Series Editor: DUNCAN CROW

The Author particularly wishes to acknowledge the generous help and information received from the Royal Armoured Corps Tank Museum without which this Profile could not have been written.

Medium Tank A7E2. Development work on the A7 14-tonners was stopped in 1937 but they contributed different points to the A12 (Matilda), the Churchill, the A9 and the A10.

(R.A.C. Tank Museum)



	Development No.	W.D. No.	Registration No.	M.E.E. No.	Maker and year*	Remarks
A6s or 16 Tonners	A6E1	T404	ML8698	MEE97	VA. Sep. 1927	Mild steel
	A6E2	T405	ML8699	MEE123	VA. Sep. 1927	Mild steel
	A6E3	T732	MT9637	MEE225	VA. Oct. 1928	Mild steel
Medium Mark IIIs	Mark III E1	T870	MT9707	MEE742	ROF. May 1929	Armour plate
	Mark III E2	T871	MT9708	—	ROF. May 1929	Armour plate
	Mark III E3	T907	MT9709	—	VA. Feb. 1931	Armour plate
A7s or 14 Tonners	A7E1	T816	MT9639	MEE383	ROF. May 1929	Mild steel
	A7E2	T817	MT9640	MEE493	ROF. May 1929	Mild steel
	A7E3	T1340	BMM117	MEE961	ROF. May 1934	Mild steel
A8	A8E1	T1341	BMM118	—	VA. —	Never completed

*VA—Vickers-Armstrong. ROF—Royal-Ordnance Factory, Woolwich

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5	Light Tanks Marks I–VI	20	Sherman ‘75’
6	Valentine—Infantry Tank Mark III	21	French Mediums
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