

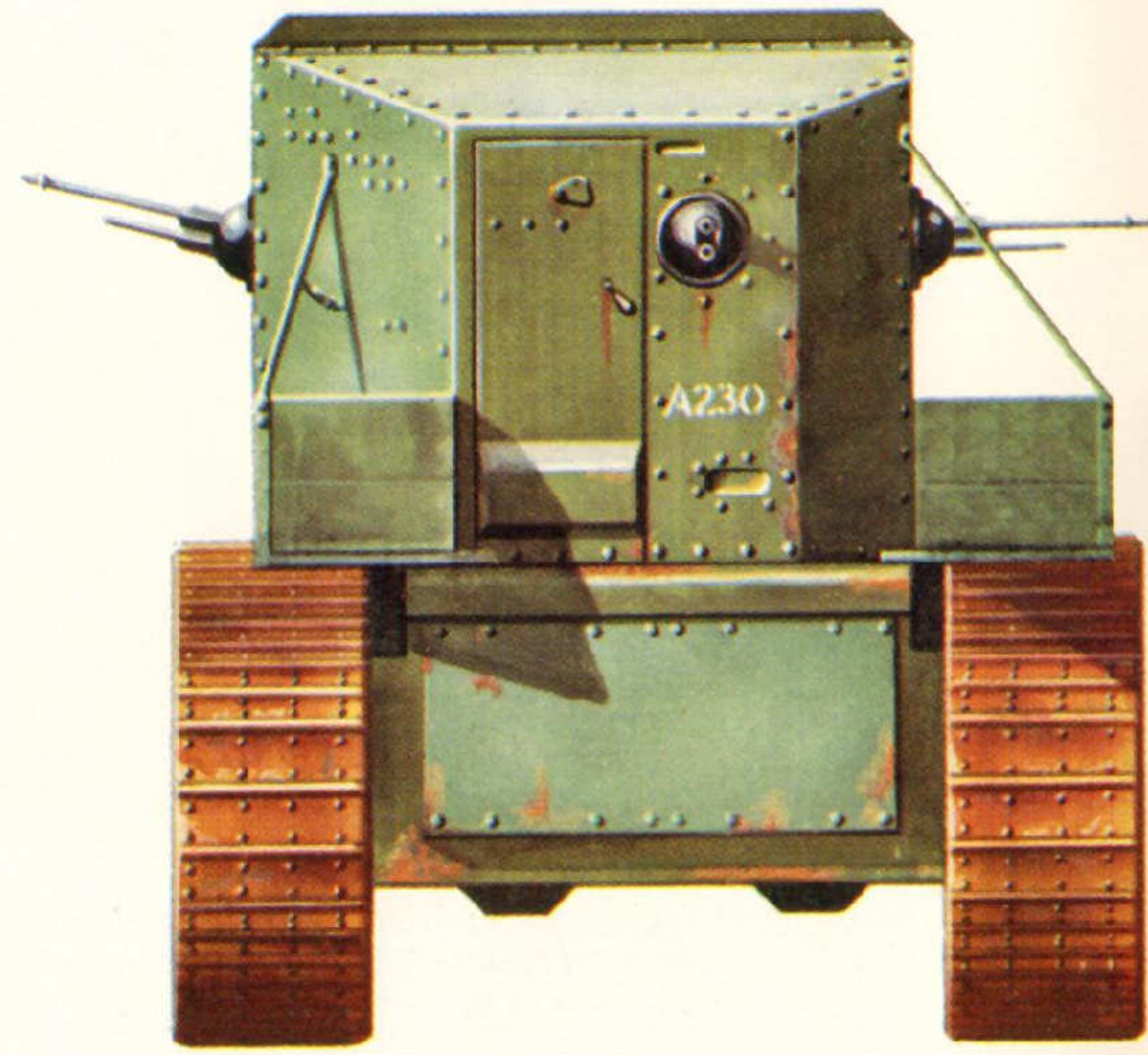
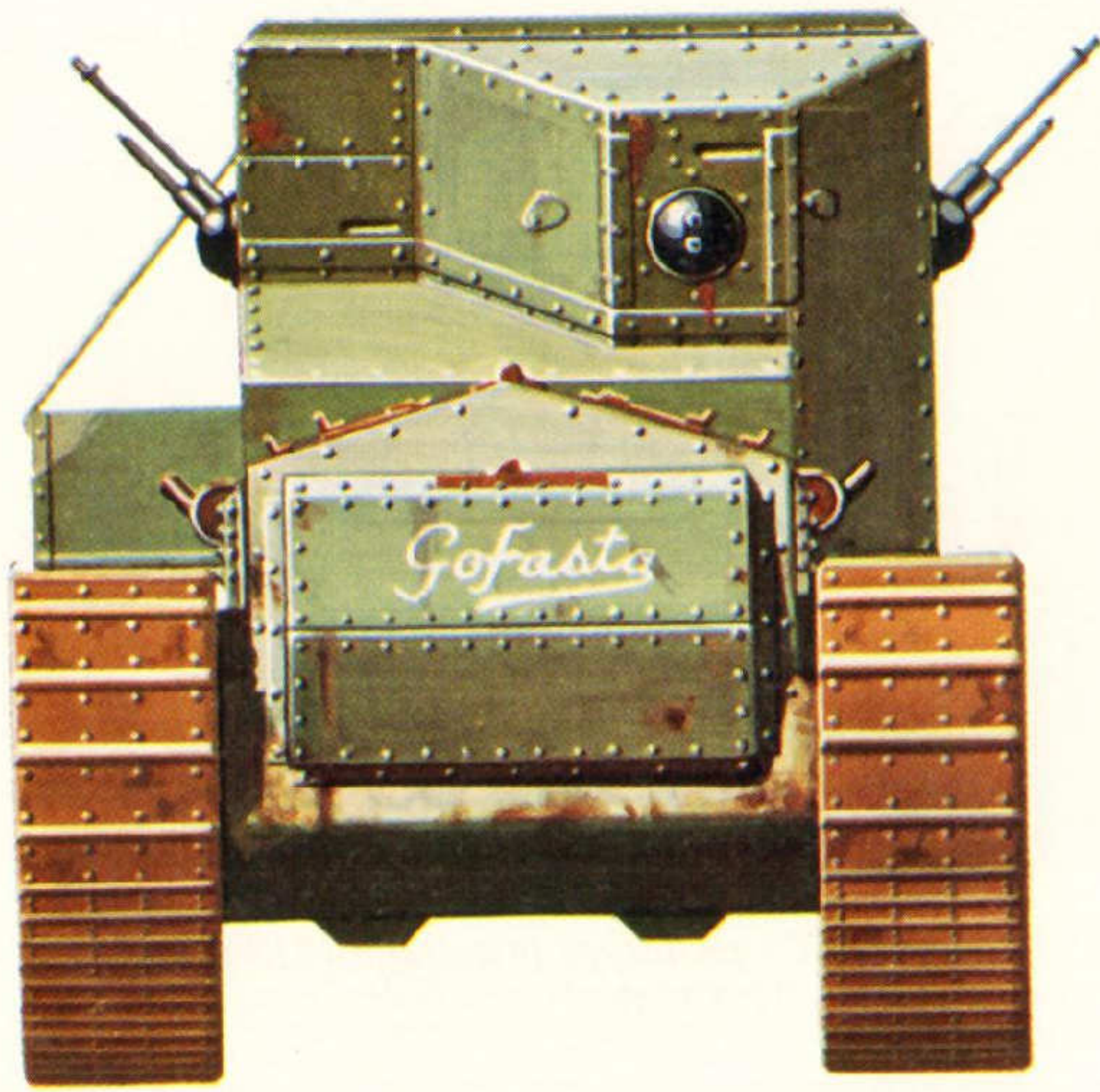
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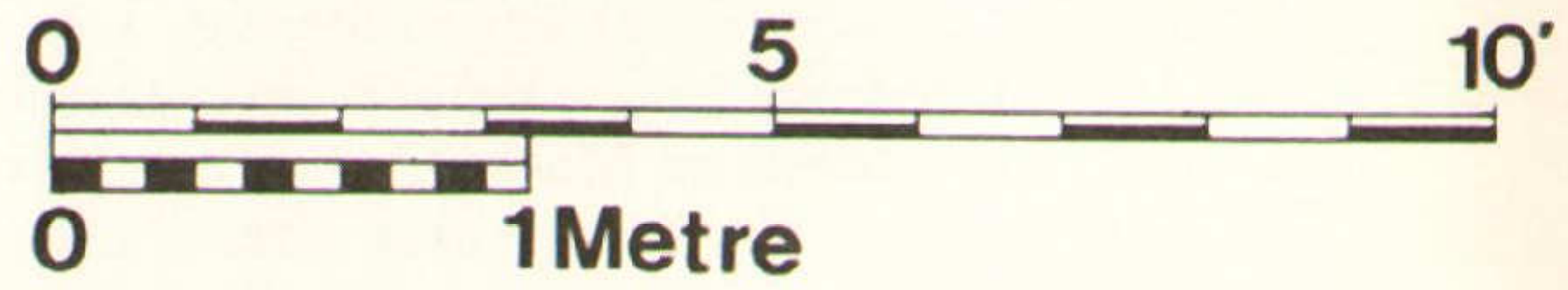
MEDIUM TANKS MARKS A-D

FIVE SHILLINGS

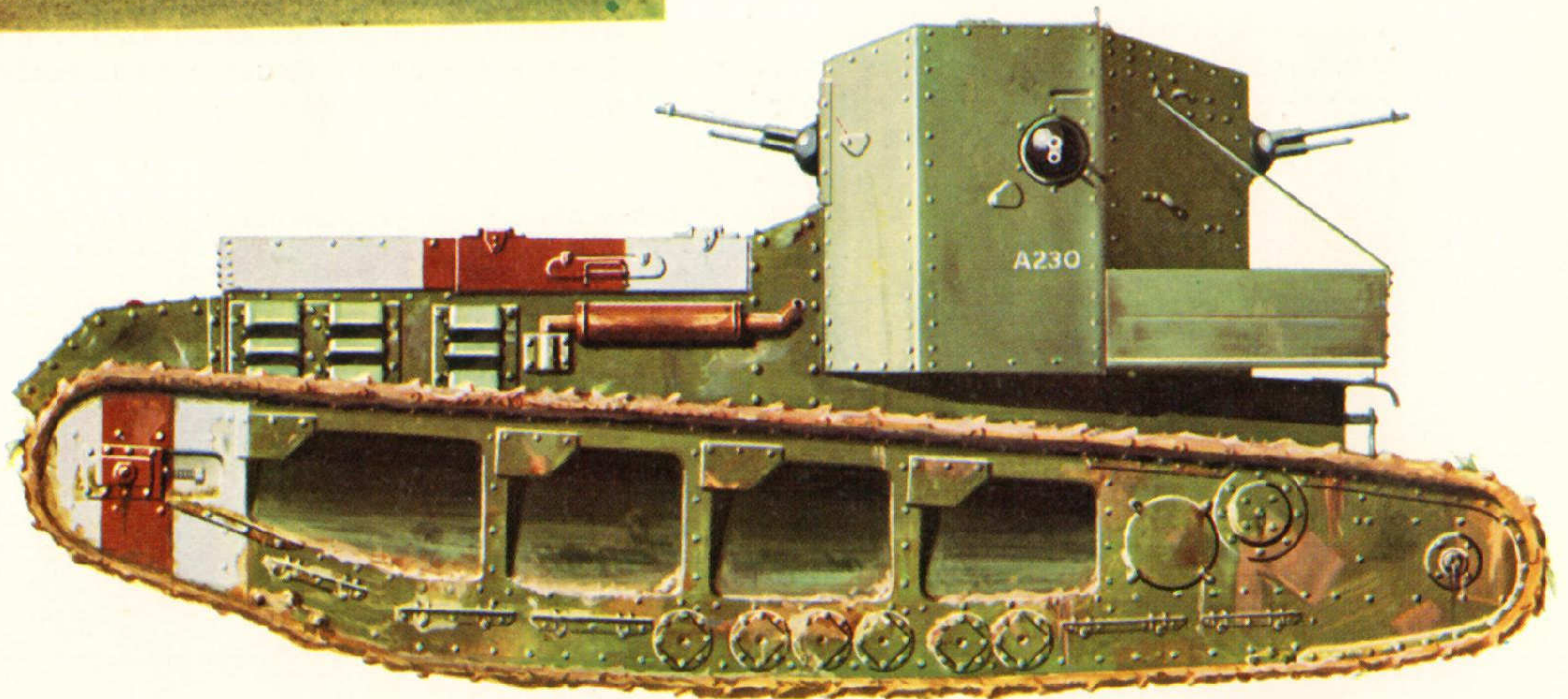


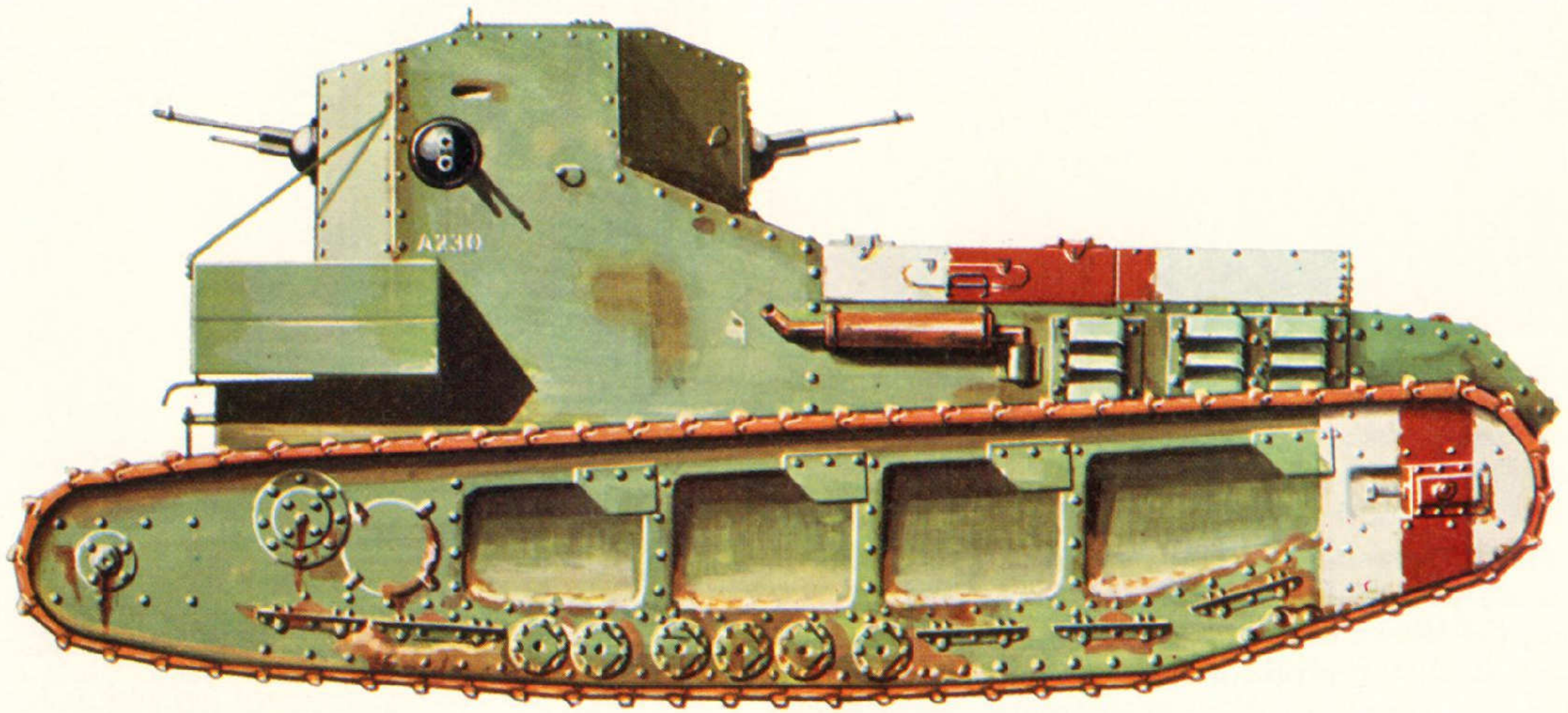


Gofasta



FANNY ADAMS





Medium Mark A Whippet tank of 17th Battalion, Tank Corps,
based at Marlborough Barracks, Dublin, June 1919

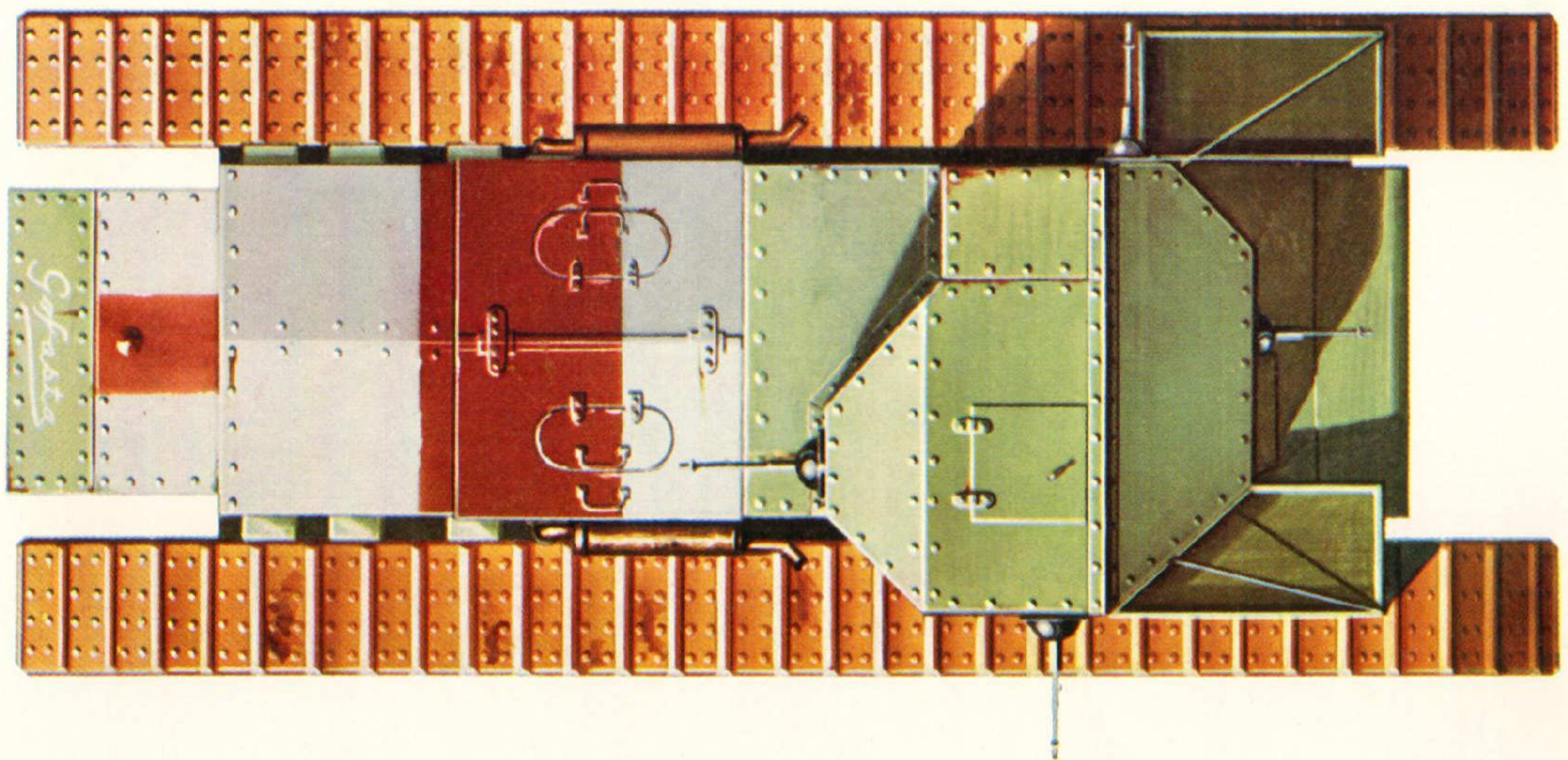
Whippets of this unit:

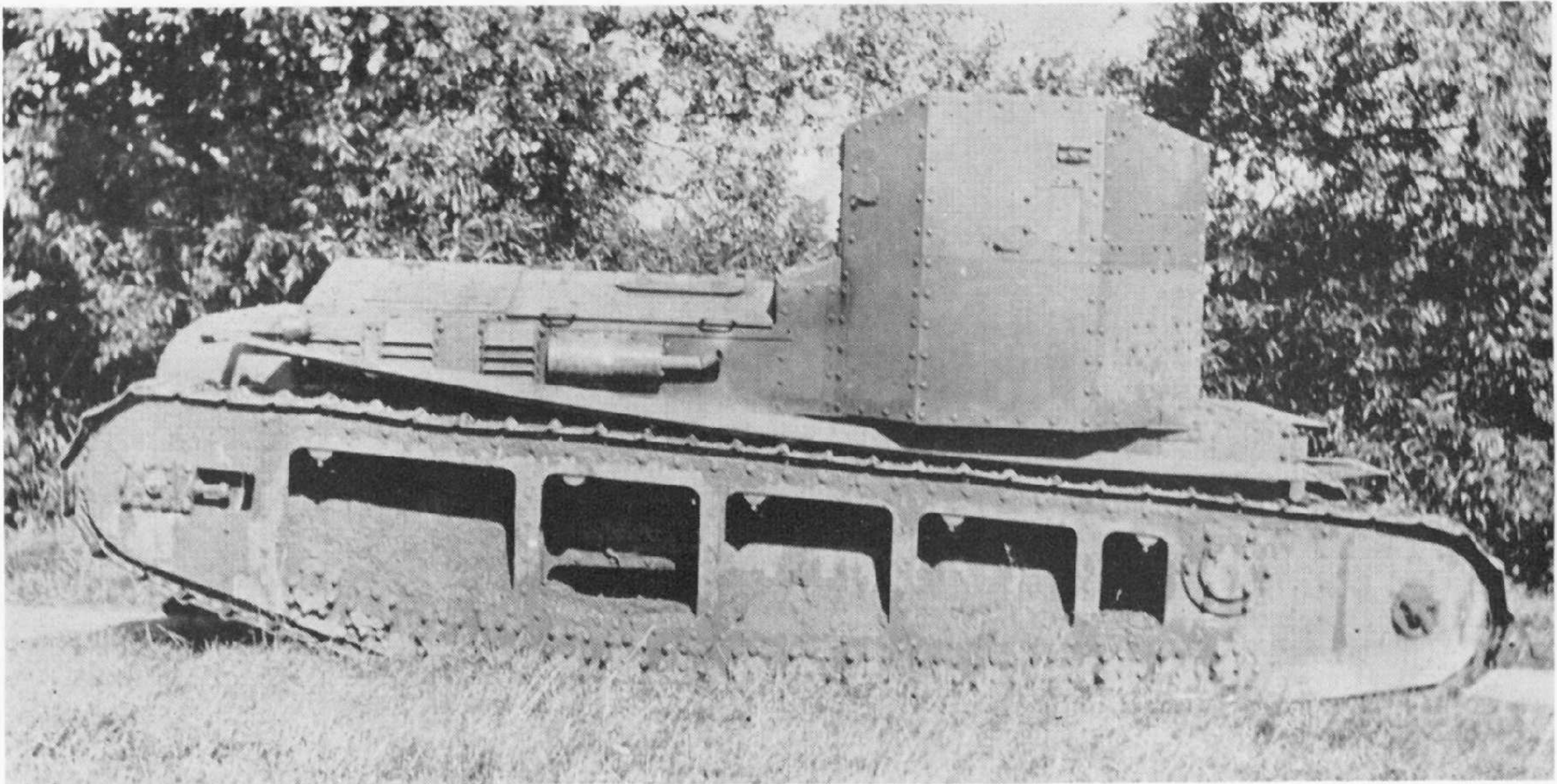
A230 'Gofasta'

A378 'Golikell'

A351 'Fanny Adams'

A289 'Fanny's Sister'





The prototype Whippet after the fuel tank had been moved to the front. The join in the superstructure where the turret was replaced with fixed superstructure can be clearly seen in this view. (Imperial War Museum)

Medium Tanks Marks A to D By Chris Ellis and Peter Chamberlain

THE earliest practical ideas on tank tactics had been evolved by Colonel Swinton, commander of the new British tank arm, in February 1916. In a document entitled "Notes on the Employment of Tanks" which he had been working on since soon after the "Little Willie" prototype first ran, Swinton postulated some very clear ideas for the future. Most important of all he wrote "tanks must not be used in dribbles". Instead he suggested that they should be held secretly until as many as possible could be launched on the enemy in one massive attack with an infantry follow-up, thus taking full advantage of the element of surprise with the new weapon.

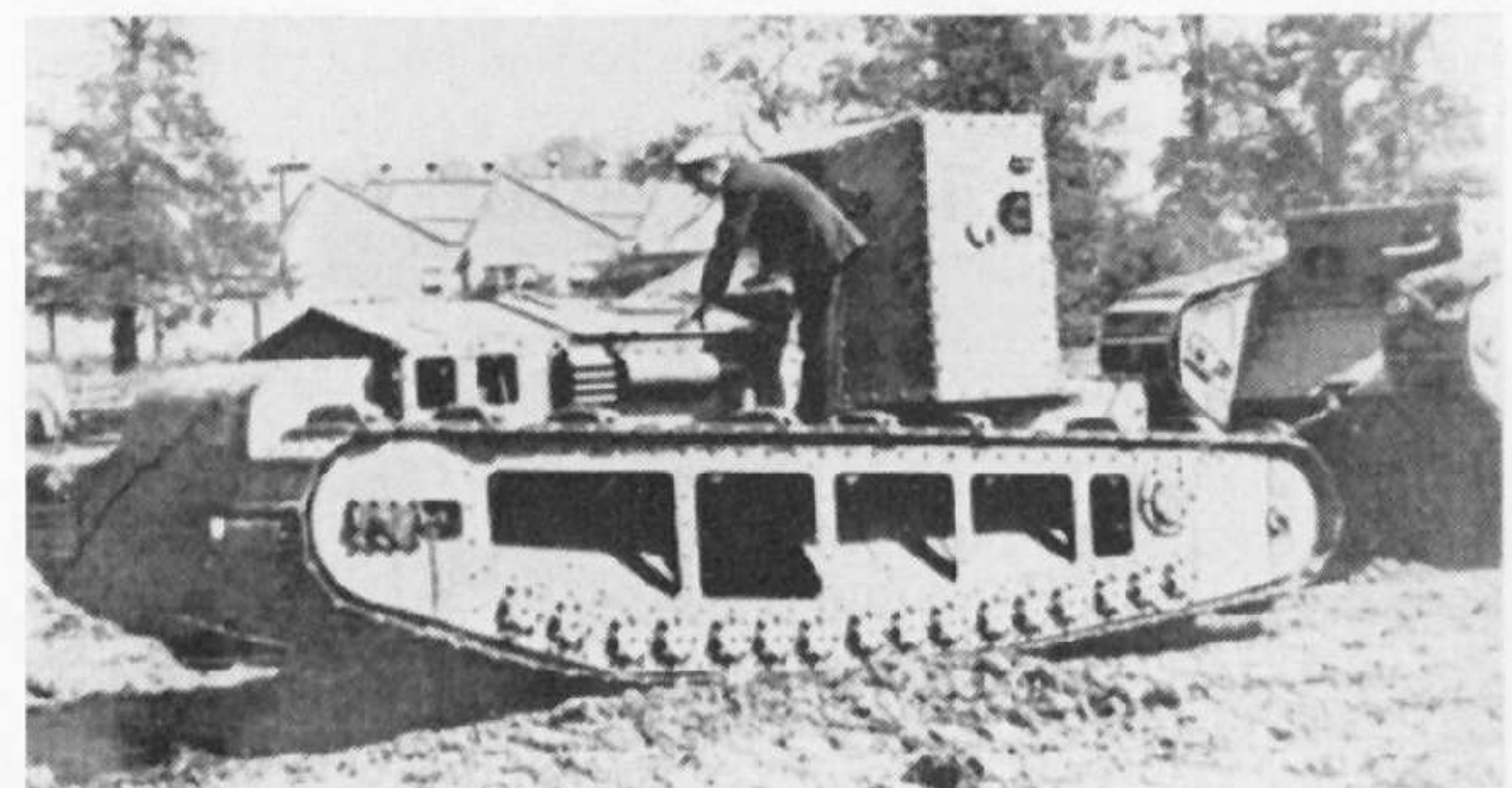
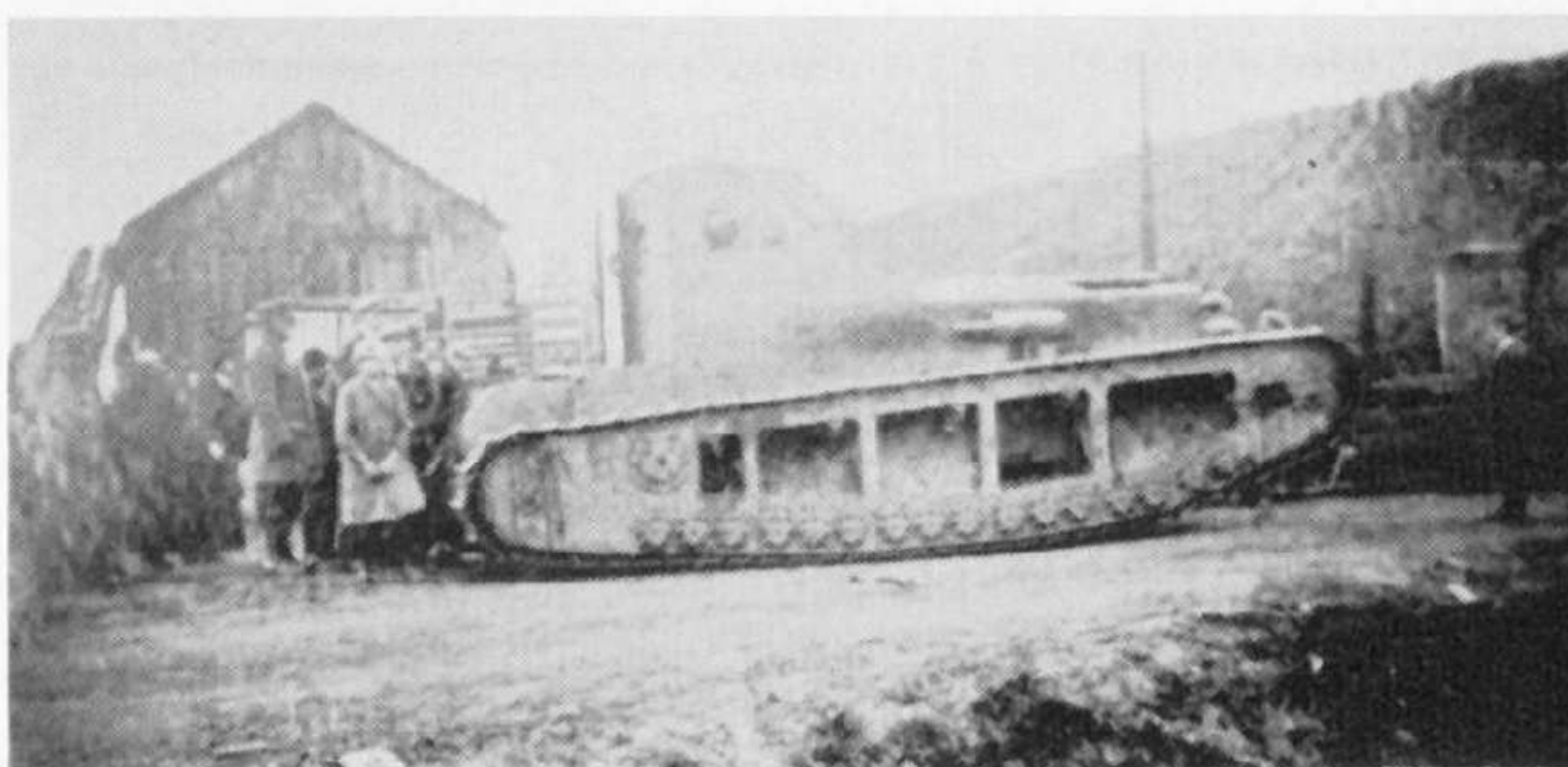
Though Haig, the British C-in-C, and his staff saw and agreed with this document they conveniently overlooked the "mass attack" theory in their haste to use the available tanks as a new expedient on the Somme for the first ever tank assault. It was not until the Battle of Cambrai that tanks were used in the way Swinton had envisaged—and that was more than a year later. Meanwhile prior to the Flers-Courcelette action even Swinton had given little consideration to

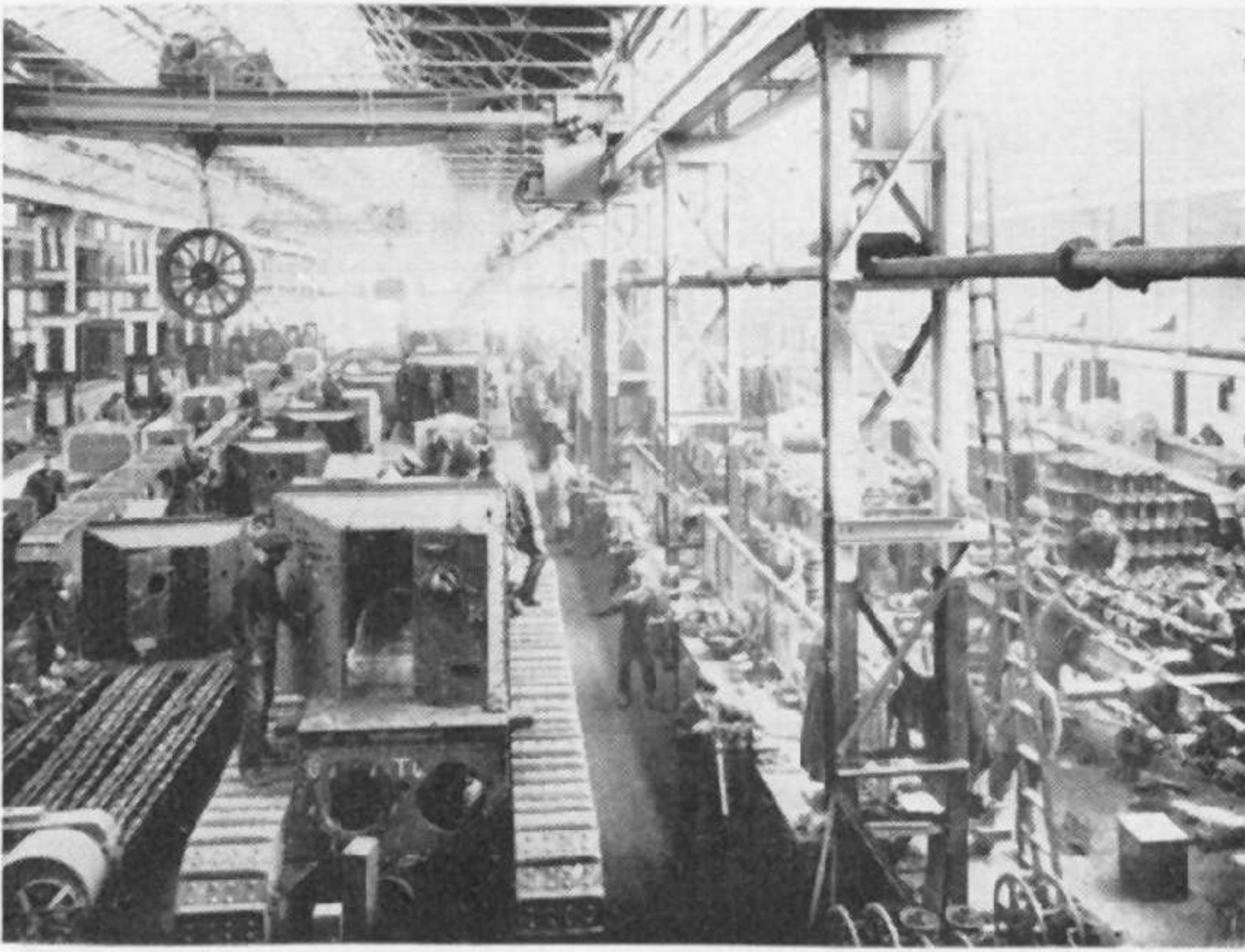
what happened if a tank attack was successful. Initially the tank was regarded as "an armoured machine-gun destroyer". Swinton's document regarded the tank as an auxiliary to an infantry advance and still envisaged the use of massive artillery support prior to an attack. At most he regarded tanks as a means of reaching the enemy front line and "keeping it under enfilade, only until our assaulting infantry have reached it, when they will proceed straight ahead at full speed for the German second line... following up the hostile communications trenches which they will sweep, thus dealing with any German reinforcements or bombing parties coming up". Beyond this Swinton was vague, leaving the onus on "the extent of the attack" to the Commander-in-Chief and at this early stage he presumably fell in with conventional thinking, leaving any further exploitation of the "breakthrough" to the cavalry.

First ideas for a specialised type of tank to take over or supplement the cavalry role originated in the Tank

The Medium Mark A prototype as first turned out, after removal of the rotating turret and substitution of fixed superstructure. Note the rear-mounted unarmoured round fuel tank cover. (Imperial War Museum)

The prototype Whippet, now seen with cut-outs for the gun mounts in the superstructure. This view shows the vehicle with spuds fitted to the tracks, a Whippet standard fitting rarely seen in pictures. (Imperial War Museum)

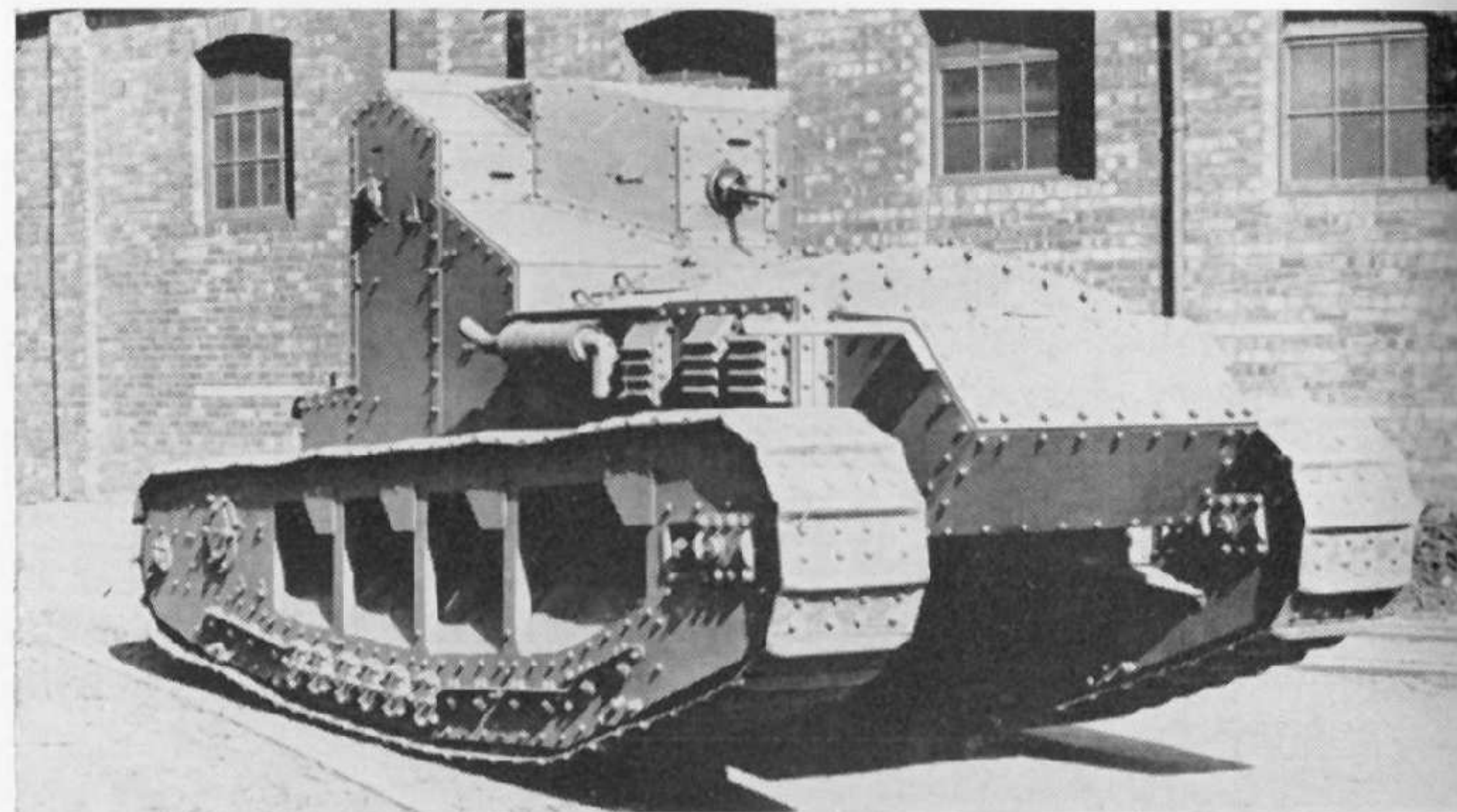
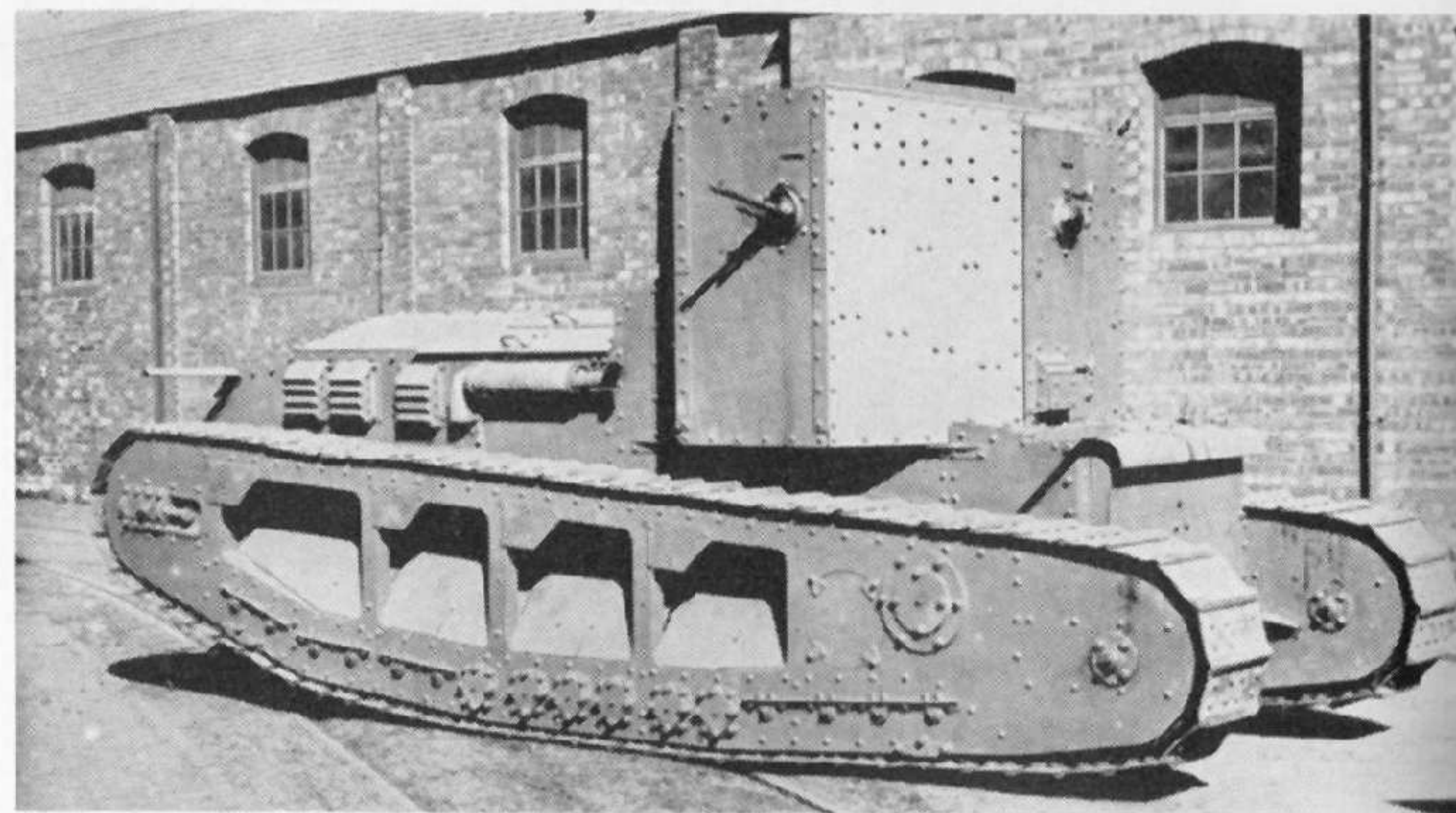
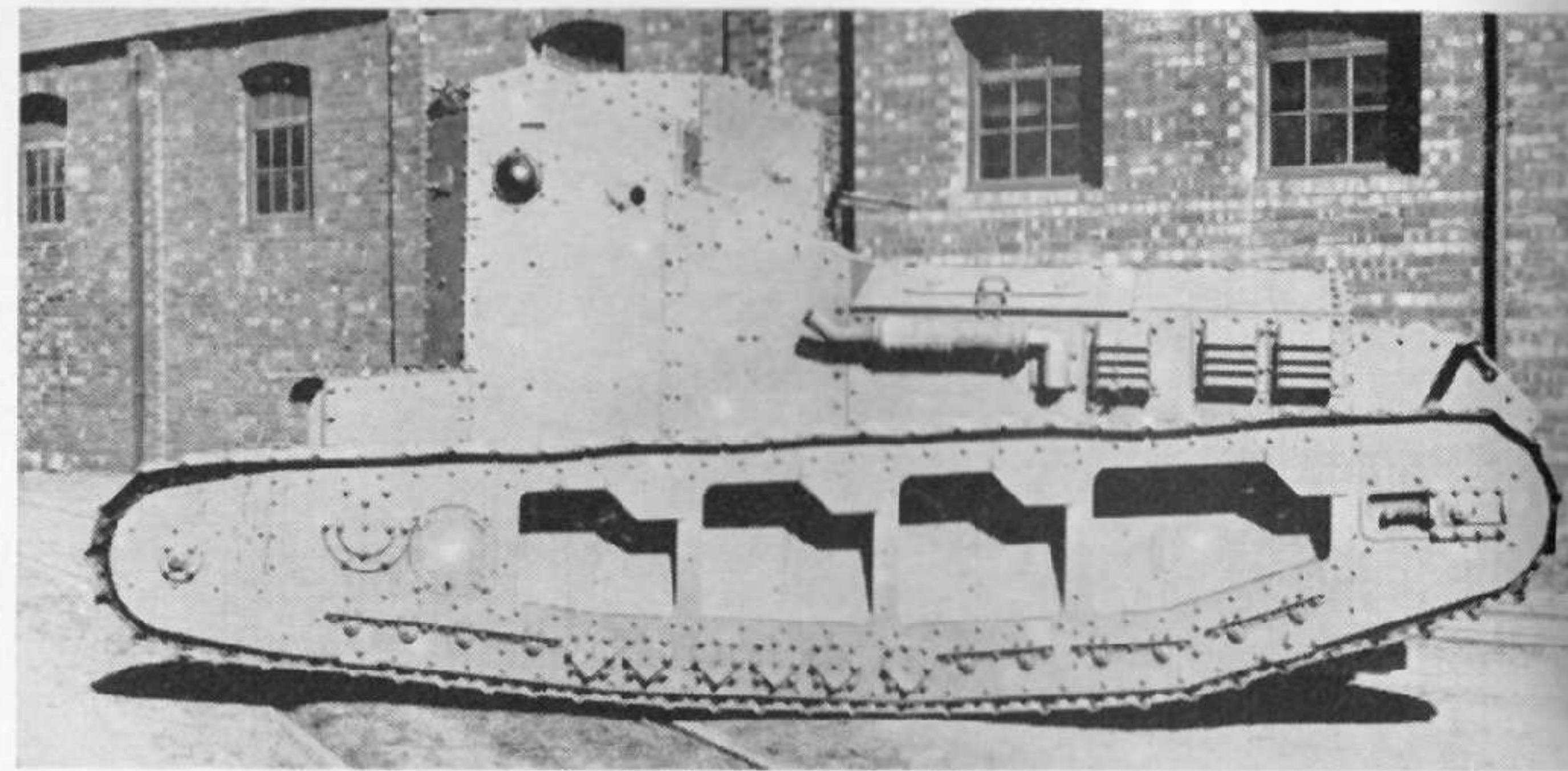




Medium Mark A Whippets in production at the Foster plant in December 1917. Basic simplicity of assembly is apparent. Note access holes to transmission visible in nearest machine. (Imperial War Museum)

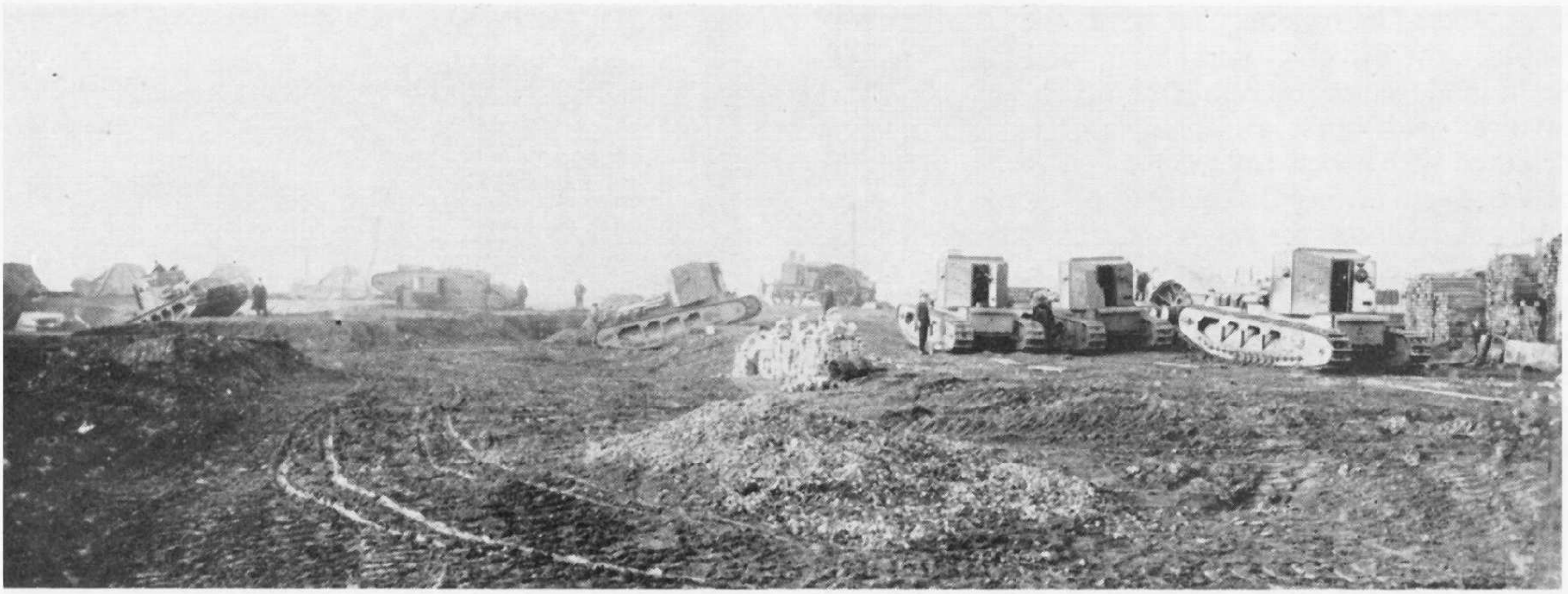
Supply Department, the body formed earlier in 1916 under the Tank Supply Committee (successor to the Landships Committee) which was responsible for tank design and procurement. Just a week after the first tank action, on September 23, 1916, the key men of the Tank Supply Department sailed to France to visit General Estienne who was working on the development of tanks for the French Army. The party included the energetic chairman, Albert Stern, who had just been promoted Lieutenant-Colonel, Major Wilson and Mr. William Tritton who had designed the Mark I tanks, and Mr. Tennyson d'Eyncourt. On September 26 they moved on from Paris to "The Loop" near Bray-sur-Somme where the Heavy Section, Machine Gun Corps tank companies had set up their temporary headquarters for the Somme operations. Here they learned impressions of the Flers-Courcelette attack at first-hand from crews who took part, met numerous senior officers, and returned to Britain on September 28. Their next consideration was to be the design of the thousand extra tanks which Haig had asked for as a result of the Flers-Courcelette action.

The notion of a "chaser" or cavalry tank originated from Tritton who suggested it at a meeting on October 3. One of the problems which the Tank Supply Department had had to accept in the interests of urgency was the inadequacy of the Daimler 105 h.p. engine used in the Mark I tanks, and the crudity of the transmission and gearbox. Not only was the Mark I difficult to steer, but it was also underpowered and hence too slow. To obtain a better performance it was decided to experiment with various alternative methods of drive and transmission in existing tanks to determine future mechanical development. Tritton suggested that one way to obtain more power was to use two engines. He was already working on a super-heavy tank (the "Flying Elephant", later cancelled) with twin Daimler engines to give adequate power, and it is logical to suppose that this experience led him to suggest twin engines for the fast "chaser" tank he had in mind. Using two engines, one for each track, also seemed to offer a solution to the steering problem. Tritton suggested that the new vehicle should be only lightly armed, its main feature being a high speed for following up an advance.



Three views of a standard production Whippet photographed at the Foster factory, Lincoln, for Foster's archives. Vision slots and pistol ports can be clearly seen. Machine-guns are not all mounted. (Imperial War Museum)

Though there was no official requirement on paper for a vehicle of this kind, enthusiasm for promising new designs was not lacking within the Tank Supply Department at this period. Basking in the recent success of their "progeny" at Flers-Courcelette, Stern decided to put Tritton's idea to the Machine Gun Corps for their consideration. A month later he had a meeting at GHQ in France with General Davidson of Haig's staff and Colonel Elles, commander of the tanks in France. They agreed that the idea of a cavalry tank would be useful and Tritton was asked to work out the design in detail on November 10. Stern's next task was now to get approval from the Ministry of Munitions for procurement of the necessary engines and components. This was forthcoming at a War Office meeting held on November 25 and Tritton was given the go-ahead to complete a running prototype.



Foster's test ground adjacent to their Lincoln factory with brand new Whippets being run in. Mk. IV tank and Foster-Daimler tractor can also be seen in far distance. (Imperial War Museum)

THE TRITTON CHASER

Tritton had already bestowed a name on his project, calling it a "Whippet" tank, an appellation which stuck and was for many years afterwards frequently used as a general description for any fast light tank. To the Tank Supply Department at this time, however, the project was known more prosaically as the "Tritton Chaser" or "Tritton No. 2 Light Machine". William Tritton was nothing if not economical as a designer, frequently "borrowing" features from others of his designs. The "Whippet" was no exception. It did not need the stability and ground contact of the lozenge-shaped heavy tanks, for trench-crossing was not the main requirement. What was needed was economy of weight to give the best possible speed and performance. Therefore Tritton went back to the old discarded "Little Willie" design and used the low tracks and track frames almost unchanged in pattern but slightly lengthened overall. The twin engines were Tylor 45 h.p. units of the type then used in London buses, four-cylinder petrol motors which were readily available. Mounted side-by-side towards the front of the chassis, each engine had its own constant mesh gearbox connected by a cone clutch and giving four forward speeds and one reverse. Drive was by chains, via worm

reduction gears direct to the track sprockets. The superstructure was minimal, also for lightness, and consisted of a low armoured "bonnet" over the engines and a full-width driving and crew compartment at the rear behind the engines and set above the gearboxes. Surmounting the rear compartment was a small cylindrical turret taken straight from an Austin armoured car of the type then in production. This turret gave all-round traverse (by hand) and was to be fitted with a single Lewis gun.

Construction of the prototype machine started at Foster's works at Lincoln on December 21, 1916 and it made its first powered run on February 3, 1917. A week later, on February 11, it underwent full running trials on the small test ground adjacent to the Foster factory. At this time there were still no definite orders for such a vehicle and, indeed, the whole future of tanks was still somewhat in the balance. By now the Tank Supply Department had been renamed the Mechanical Warfare Supply Department, and Stern, its Director-General, was engaged in holding off the "anti-tank" generals from the War Office while at the same time organising development and design work for the "second generation" tanks to succeed the thousand vehicles (which became the Mk IVs) ordered

Whippet tanks on the ranges at Bovington for crew training in October 1918. (Chamberlain Collection)

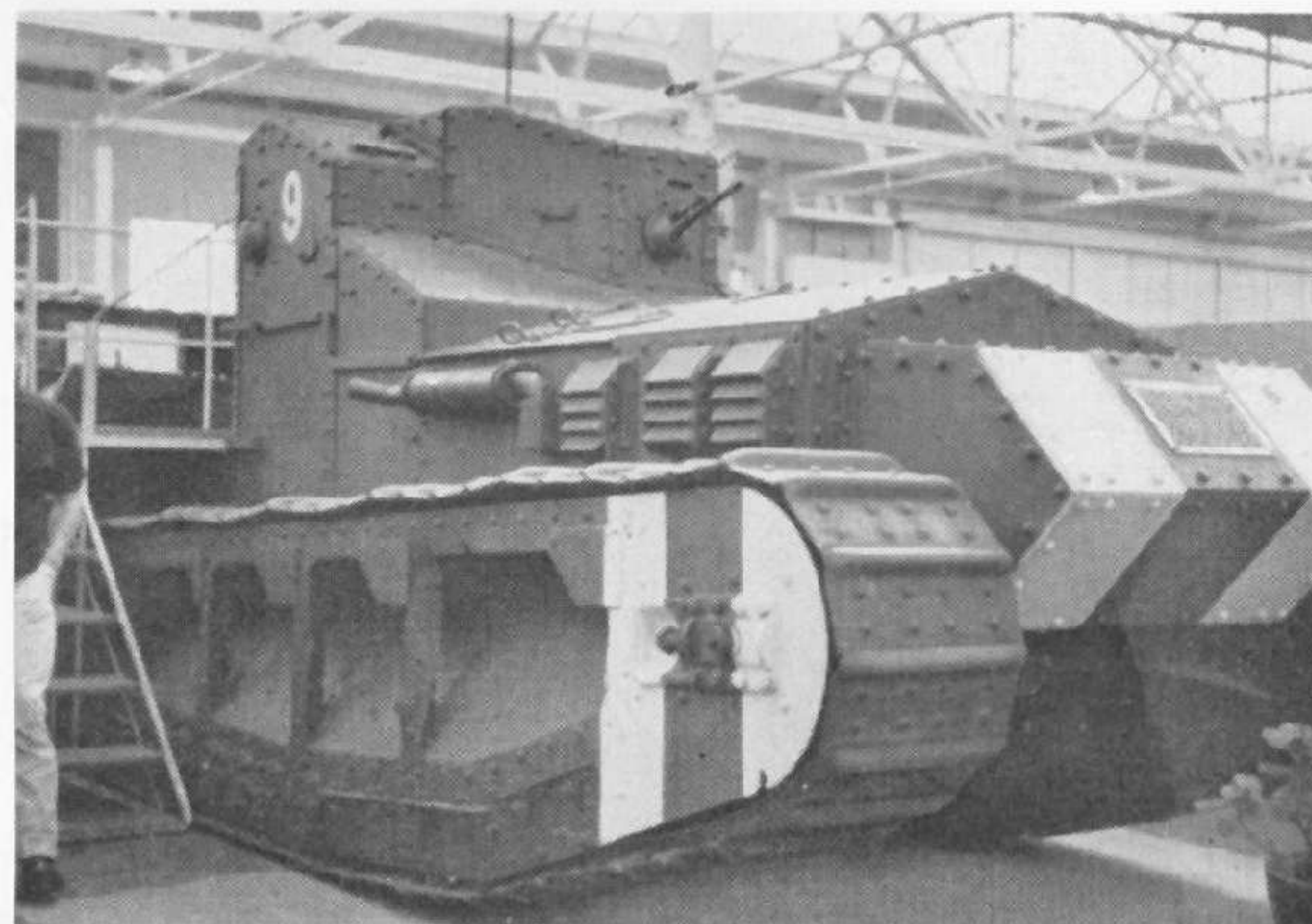


after Flers-Courcelette. To give the British War Cabinet, the British General Staff, the French General Staff, and senior officers and other key personnel involved with tanks a clear idea of what was being achieved with a view to hastening decisions on further orders, Stern arranged a secret display of experimental tanks and prototypes for representatives of all these factions. This took place at the Mechanical Warfare Department's testing ground at Oldbury, Birmingham on March 3, 1917. Tritton's "Whippet" was included, though it was very much outside the scope of the official purpose of the demonstration which was to show off the various proposed transmission and drive arrangements under consideration for the rhomboidal heavy tanks.

The official programme handed out to the party of official observers called the vehicle "Tritton's Light Machine No. 2" and described it as "... meeting the requirements of the military authorities for a light machine capable of maintaining higher speeds than the Standard [*sic*] machine. Its twin engine transmission is worthy of note". The lightness of the armour was stressed: "The vital portions... are armoured with 9 mm. plate, those not directly exposed to enemy's fire being protected by 6 mm. plate".

The Oldbury demonstration appears to have been the vehicle's only "official" appearance with the revolving Austin turret as originally designed. However, due to the secrecy of the demonstration no pictures were taken—or if they were none seem to have survived. The only record remaining of the Tritton Chaser in its original form is the drawing in the official programme which does not show the Lewis gun *in situ*.

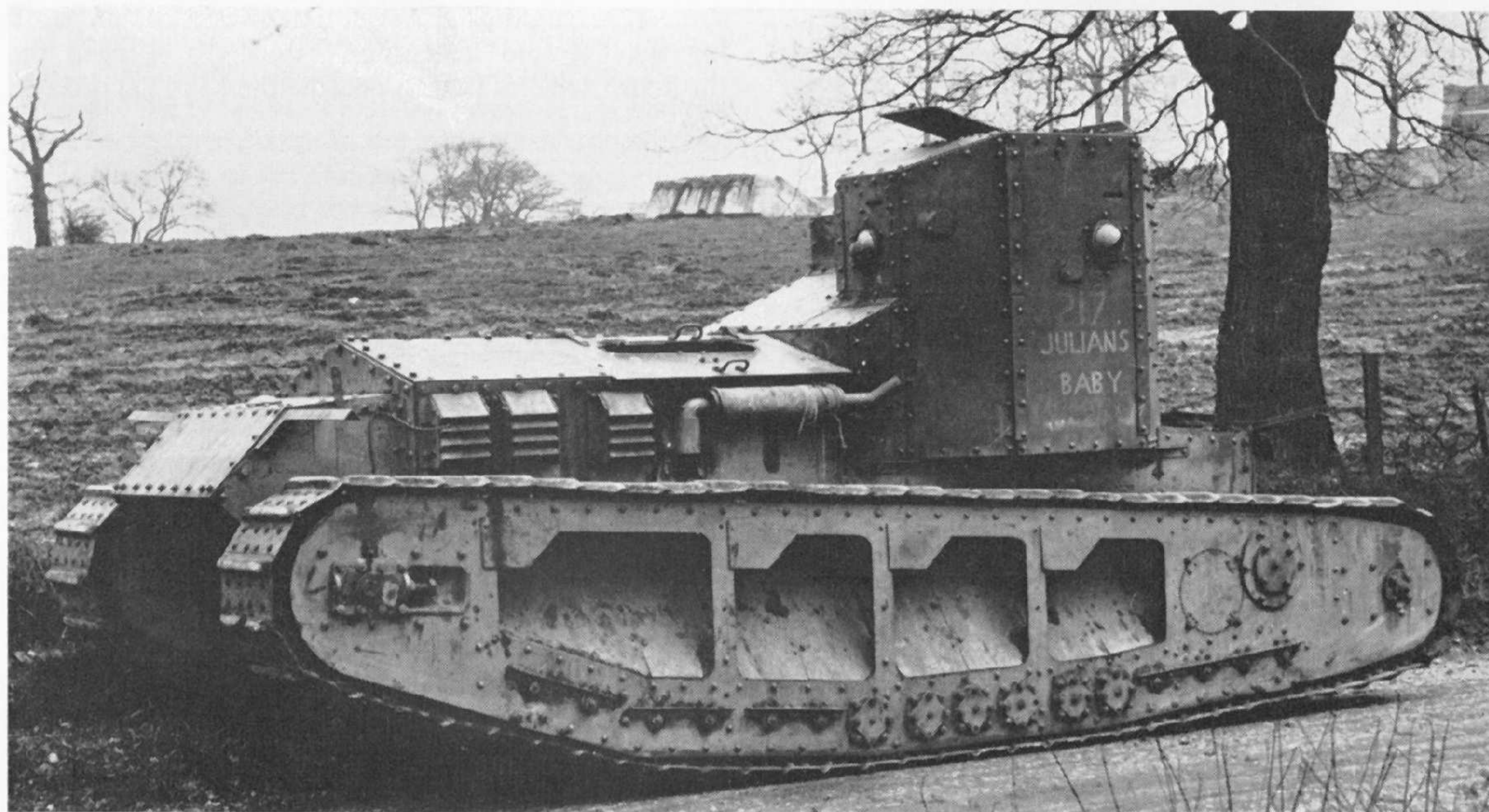
The "Whippet" tank clearly made a big impression on those who saw it. By virtue of its twin engines and high power-to-weight ratio (268.8 lbs per h.p.), it was not only more manoeuvrable but also twice as fast (at 7½ m.p.h.) as any of the rhomboidal tanks running at the demonstration.

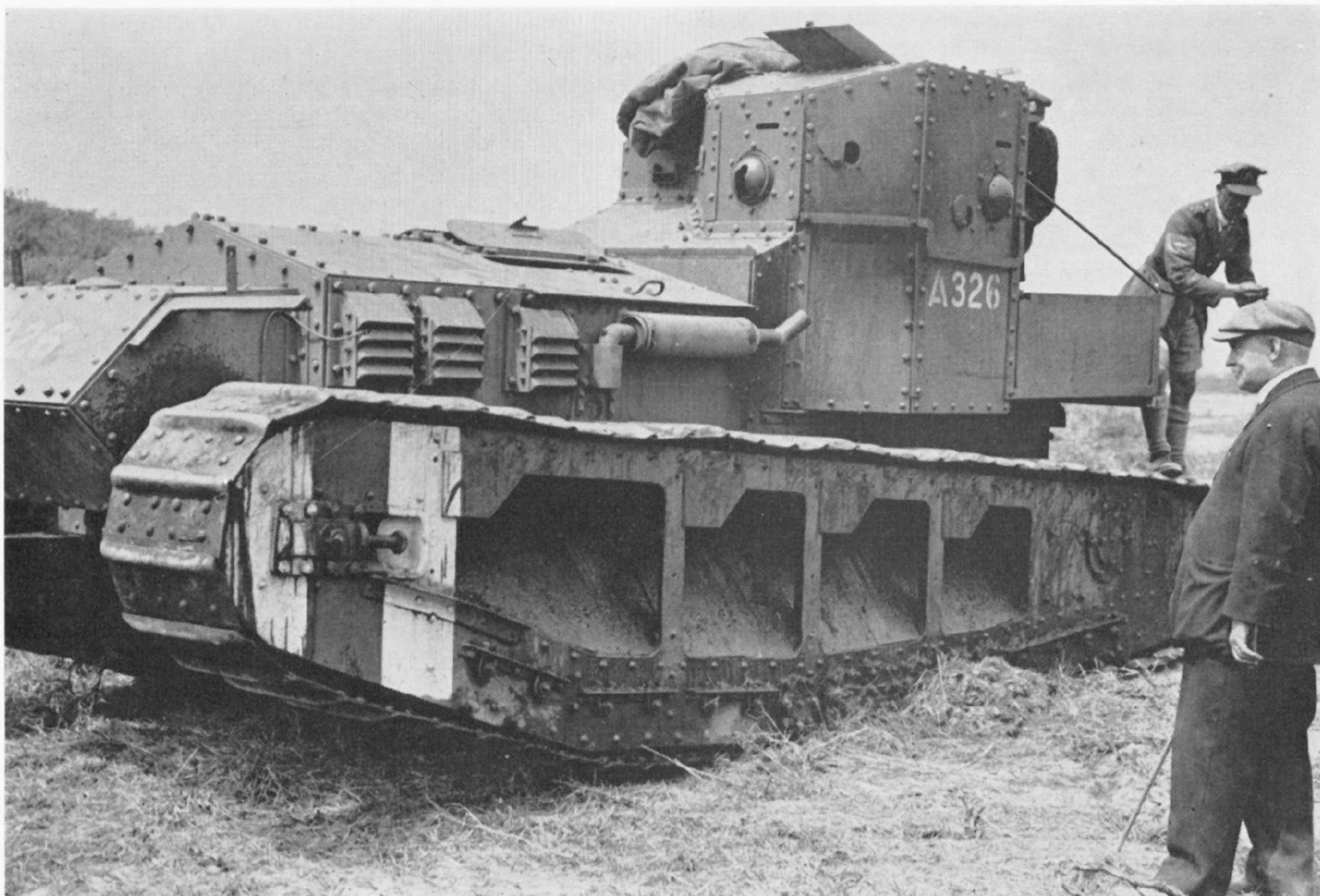


The Whippet in which Lieut. Sewell won the VC, now on display at the RAC Tank Museum, Bovington. (Chris Ellis)

On March 4, the day after the demonstration, two important meetings took place at the War Office in London for the various interested parties to consider their findings in the light of what they had seen. The first meeting, involving the British and French General Staffs, formalised inter-Allied policy for future production (the French among other things agreeing to concentrate on very light tanks) while the second meeting, involving the British General Staff, GHQ France, and the M.W.S.D. only, resulted in agreement on a big expansion of the tank force (to nine battalions each of 72 vehicles). While no instant agreement was reached at this meeting on which transmission to use in future tanks, Sir Douglas Haig the British C-in-C in France—who had been represented by his Chief of Staff, Sir Lawrence Kiggell, at the Oldbury demonstration—asked for an immediate order of 200 "Whippet" tanks, the first to be delivered by July 31, 1917, just five months later. This characteristically optimistic request on Haig's part was, of course, quite

A Whippet on the Western Front. Note that this typical production vehicle has supports on the front armoured fuel cover to support track covers which were sometimes added in service. (Imperial War Museum)



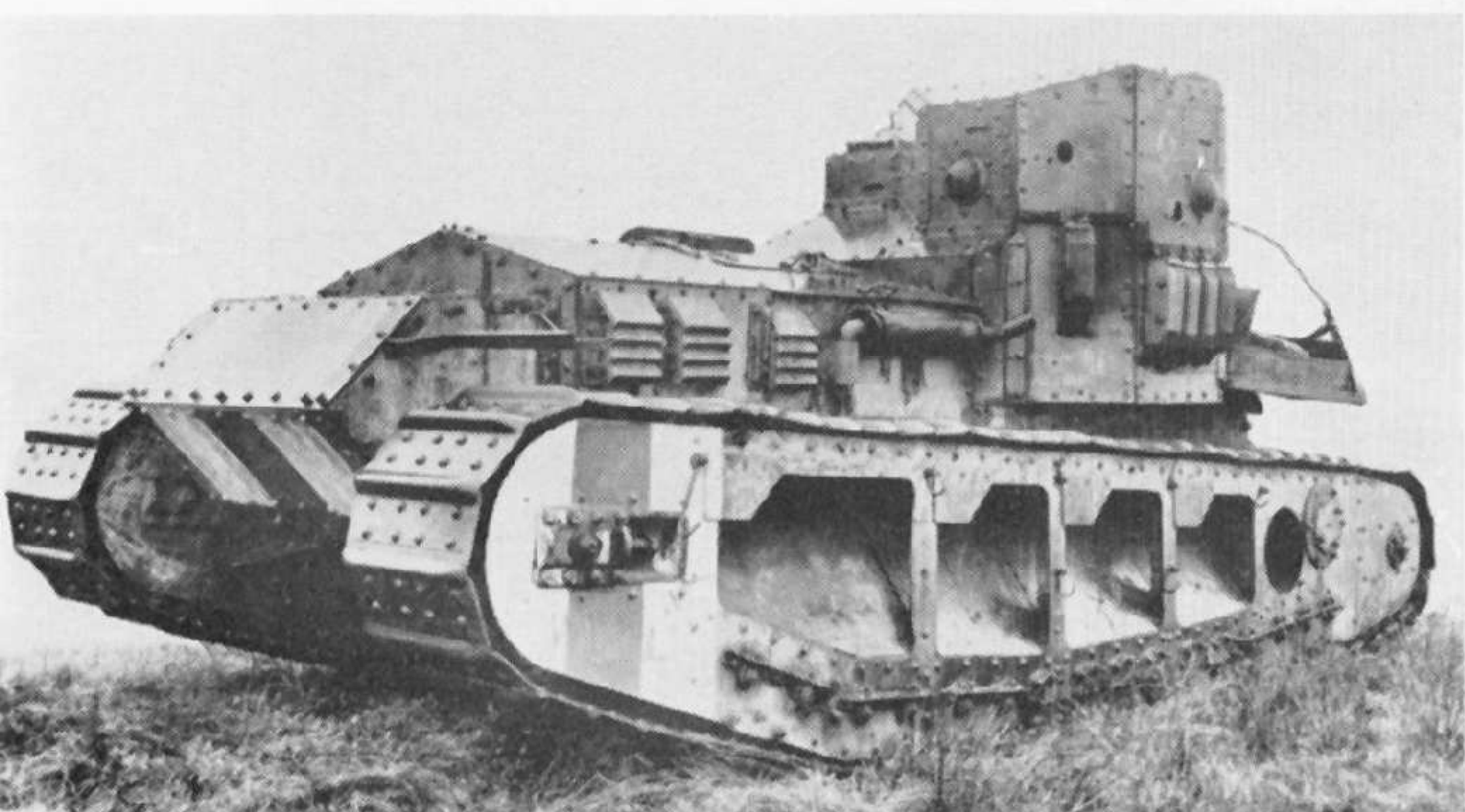


Sir Edward (later Lord) Morris, Prime Minister of Newfoundland inspecting a Whippet at the Tank Corps School, Merlimont, July 2, 1918. Note the rear stowage boxes. (Imperial War Museum)

unattainable because at that stage no preparation for production had been made and no materials ordered.

Much testing and development work had, indeed, yet to be carried out on the Tritton Chaser prototype and it was not until June 1917 that Haig's request became a firm production order. By this time, however, several changes had been made in the design, of which the most important was the elimination of the turret in favour of a fixed superstructure, the prototype being altered accordingly. The main reason for this was to simplify production. As originally built the Tritton Chaser had its turret on the left side of the rear super-

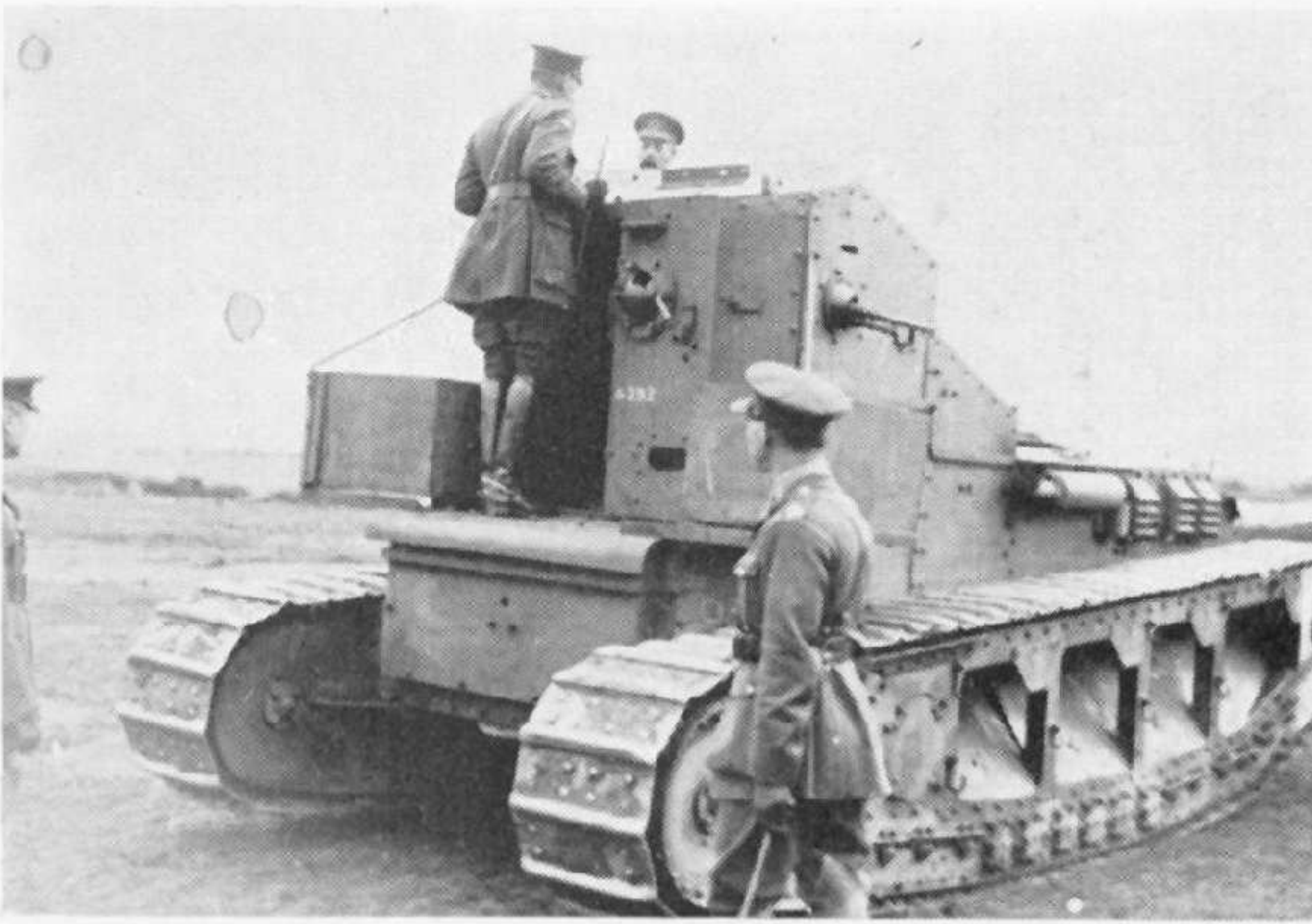
A Whippet at Bovington derelict for scrapping in 1920; this view is of particular interest since it shows how the track spuds were carried slung from a rail attached to the superstructure. The clips on the ends of the spuds slipped over the edges of the track shoes to hold the spuds in place. In many vehicles the spuds were carried in the rear stowage boxes when these were fitted. (Imperial War Museum)



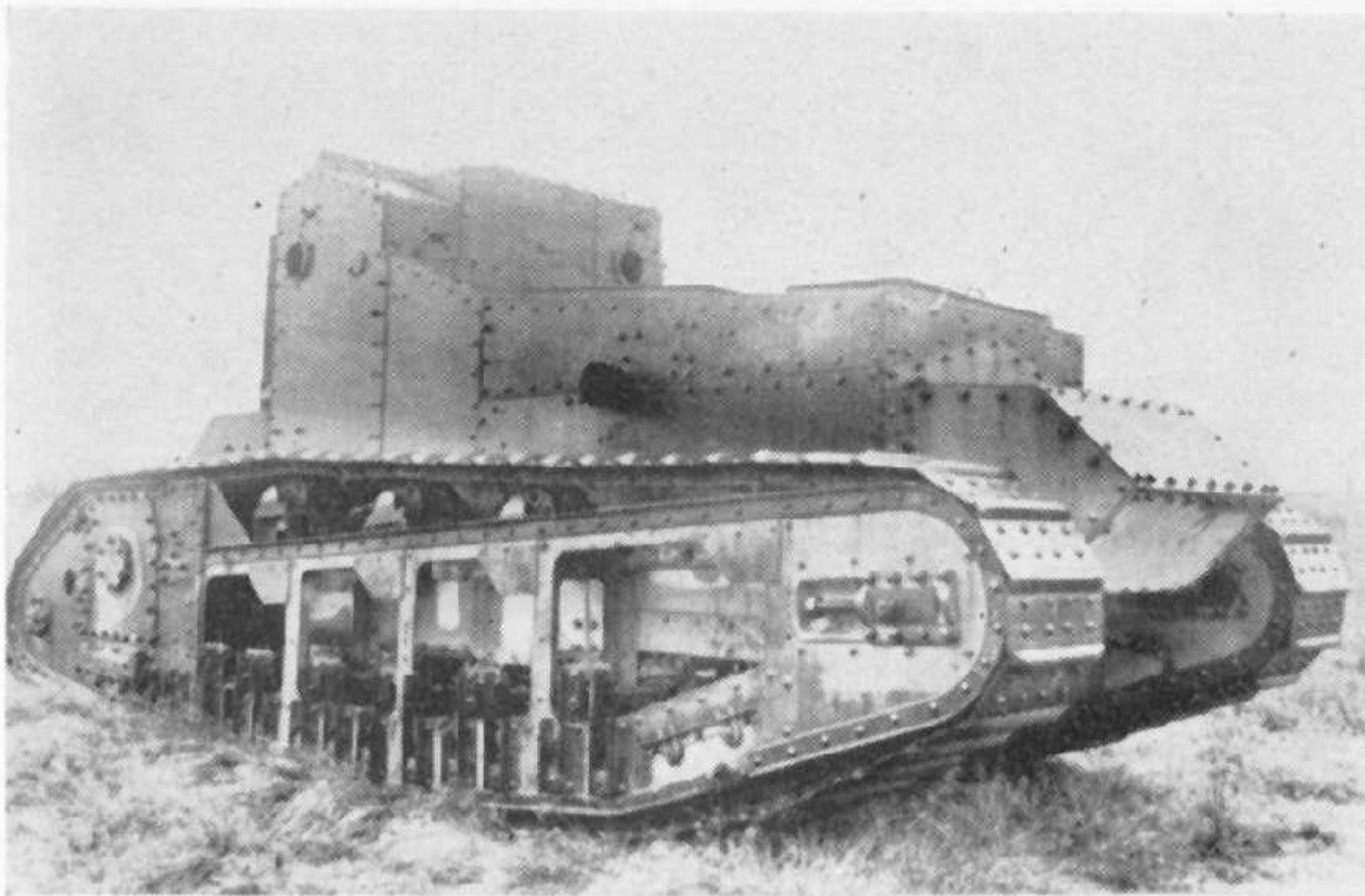
structure with the driving position to its right with a "stepped" front face forming the driver's lookout. As modified, the left-hand superstructure was built up to match the height of the driving cab and a ball-mounted Hotchkiss machine-gun was fitted in each face of the superstructure thus giving what amounted to an all-round field of fire as would have been obtained with the turret. In the prototype, the Hotchkiss guns and their mounts were not actually fitted though their positions were marked out. A further change in the prototype was the re-siting of the external fuel tank from between the rear horns to between the front horns. As originally conceived the fuel tank was rear-mounted to give a modicum of protection from small arms fire. Why it was moved forward does not appear to be recorded but it was almost certainly because its original position obscured access to the transmission units through the chassis backplate. Once moved forward it was necessary to provide an armoured cover for the now prominently exposed fuel tank, though the prototype never had such a feature.

THE PRODUCTION WHIPPET

Whippet production started at Foster's Lincoln works in the autumn of 1917, and the first vehicles were delivered to the Tank Corps in France early in March 1918. In December 1917, the M.W.S.D. had increased the Whippet order from 200 to 385, but the extra 185 vehicles were cancelled in favour of an improved design which became the Medium Mark B. The original Whippet was meanwhile designated Medium Mark A.



King George V has a conducted tour of a Whippet during an official visit to Bovington in October 1918. With him on the tank is Sir Ernest Swinton, Tank Corps commander at that time. Note the Hotchkiss machine-gun in the side ball-mount. (Chamberlain Collection)



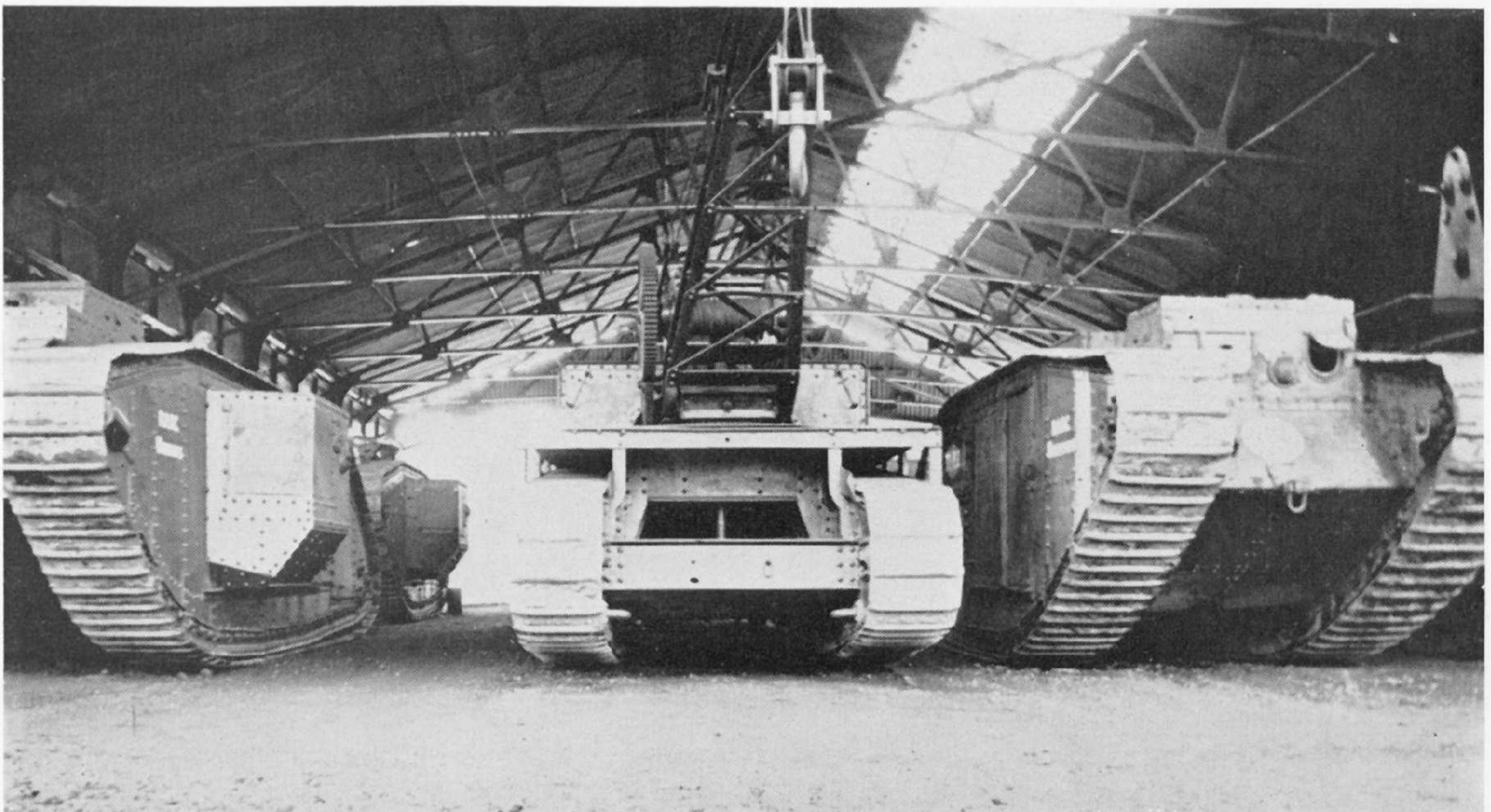
Above: The Whippet converted by Colonel Johnson to take a Rolls-Royce Eagle aero engine and sprung suspension. Note the greatly enlarged engine compartment and the new rear track frame panel which is, in fact, taken from a Mk. V tank complete with the Mk. V transmission. (Imperial War Museum)

Physical characteristics of the Medium Mark A were basically as described for the Tritton Chaser prototype, but externally production Whippets were distinguished by the simpler chassis frames which had four, instead of five, mud chutes and the bolted armour cover over the fuel tank already mentioned. A common feature on service vehicles was the addition of a stowage tray at each rear corner of the superstructure and this appears to have been a modification evolved and fitted by Central Workshops.

Tracks were of similar design to the riveted plate type used on the heavy tanks and there was no springing. Twenty rollers on each lower run of the track frames carried the weight and there were small return rollers on the upper run. Spuds could be fitted to the track shoes to improve performance in very muddy or rough going, though these differed in pattern from spuds used on the heavy tanks. The Whippet spuds were deeper, more like those used on agricultural tractor wheels, and reflect the Whippet's inferior cross-country performance compared to the heavy rhomboidal tanks. Trench-crossing ability was limited to only 7 feet with a 2½ foot parapet climb and stability was poor. At one stage experiments were carried out at Central Workshops in an attempt to improve cross-country performance. A complete set of tail steering wheels from an old Mark I tank was fitted to one Whippet and, later, a skid tail similar to that on the French Renault FT light tank was fitted. While both increased trench-crossing ability, they also led to track slipping, and no further progress was made with these ideas.

It was in the open over good going that the Medium Mark A came into its own, as indeed it was intended to. In production vehicles a flat-out top gear speed of

Below: Rare view of the Whippet converted to an ARV with crane, seen in a tank hangar at Bovington in 1920. On the left is a Mk V** converted to a supply tank and on the right is a Mk V* similarly converted with sliding doors replacing the sponsons. (Col. R. J. Icks Collection)





Trial run of the first production Medium Mark B Whippet at the Metropolitan Carriage Wagon & Finance Co. test ground at Wednesbury, Birmingham. In the group of observers are (left to right) Major Buddicom, Lieut. Shaw RNVR, Mr Harry Ricardo who designed the engine, and Major W. G. Wilson the Medium B designer. The others are Metropolitan Wagon Co. representatives. Buddicom was an assistant to Major Wilson and Shaw was from M.W.S.D. (Imperial War Museum)

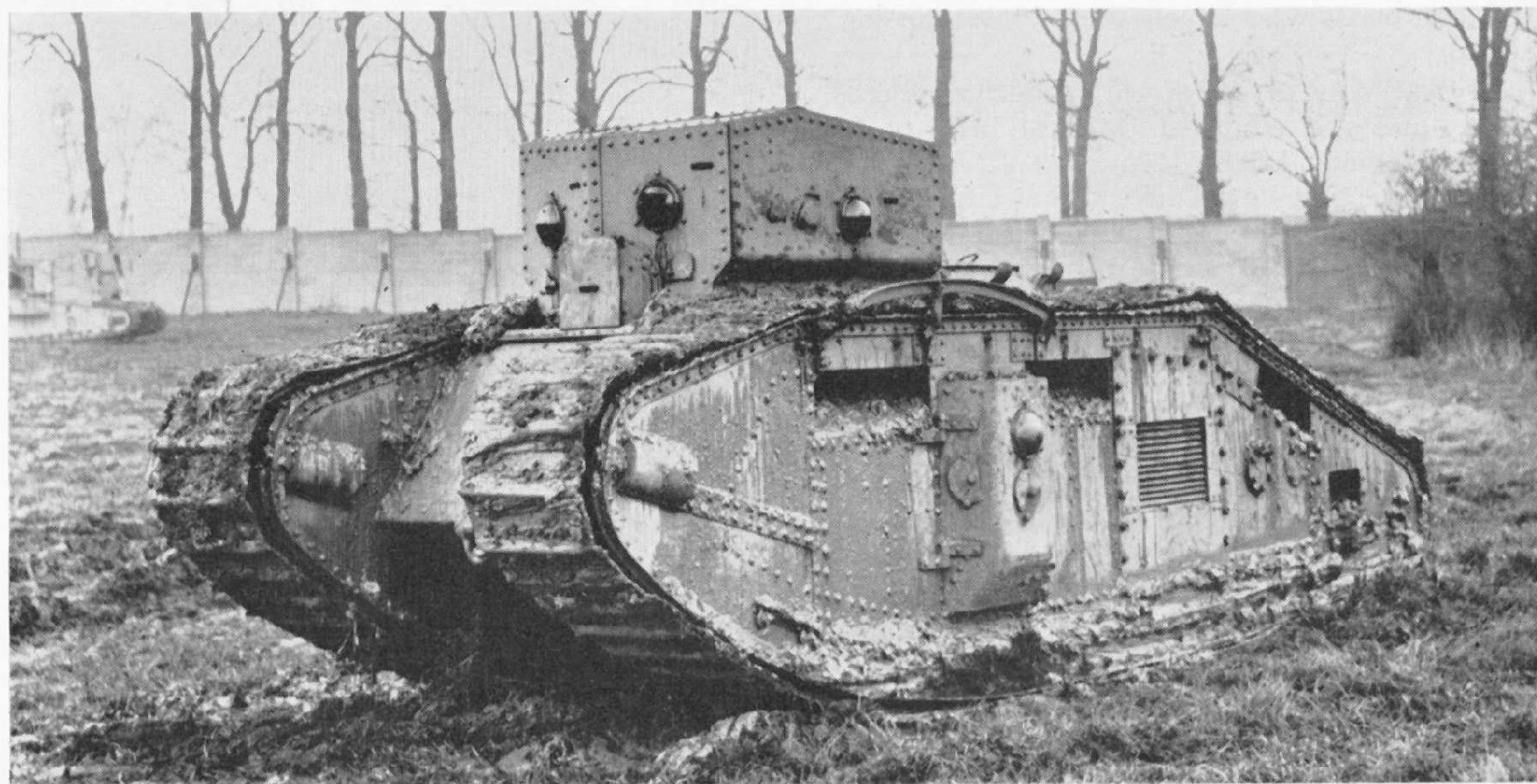
8.3 m.p.h. could be attained with a range of 80 miles. The mechanical arrangement of the original Tritton Chaser was used unchanged, each of the two side-by-side Tylor engines having its own flywheel, clutch, and gearbox. Each engine drove the track on its respective side and for straight running the two separate cross shafts (one from each gearbox) could be clutched together. Steering was effected by de-clutching the cross shafts and increasing or decreasing the respective engine speeds depending on the direction of the turn required. To turn right, for example, the speed on the right hand engine was decreased while the speed of the left hand engine was increased. For sharper turns the engine in the direction of the turn could be put into neutral, while judicious use of the brakes could sharpen the turn still more. Once the new direction of travel was established, the two cross shafts could be locked together once more to give a common drive. The cross

shaft clutch was of the friction type which allowed for variations of up to 12 h.p. between the two engines. Though this device equalised the torque of the two engines it did not allow sufficient power for one engine to drive the vehicle satisfactorily if the other engine broke down. The actual speed control of the engines was effected by a small steering wheel which acted on the throttle of each engine depending on the direction the wheel was turned.

Though most ingenious and, on the whole, successful, the mechanical arrangements in the Medium Mark A had several disadvantages. For one thing as the engines and controls were duplicated both production and maintenance were costly and complicated, and the vehicle was extraordinarily difficult to drive. Drivers needed lengthy training and much practice since the two sets of gears usually had to be changed in quick succession, followed by the coupling clutch for the cross shafts, without forgetting the steering wheel. Inexpert drivers could frequently stall one or other of the engines and a skilled driver manoeuvring his Whippet at speed under fire needed something of the dexterity—and energy—of an athlete. One Whippet commander described the interior of his vehicle in these conditions as “resembling the steam room of a Turkish Bath” with the driver “hunched up over his twin clutches and the steering wheel like a racing motorist”, the pitching compartment filling the while with cordite fumes from the machine-gun fire.

Normal crew of a Whippet consisted of the driver, commander, and gunner, but an additional gunner was sometimes carried. In theory, however, this fourth crew member was dropped, together with the fourth Hotchkiss machine-gun (which fitted in the rear access door) in order to give more room in an otherwise cramped fighting compartment and to achieve a modest saving in weight. Ventilation of the compartment, such as it was, was achieved from a fan on the transmission shaft of each engine which forced air up into the cab.

Production Medium Mark B Whippet at the M.W.S.D. test ground at Wembley. Note the bulged side door and the driver's vision flap. (Imperial War Museum)



THE WHIPPETS IN ACTION

The Medium Mark A was the only one of the British medium tank designs to see combat in the 1914-18 war. Whippets were "blooded" in action for the first time at the height of the great German offensive of March 1918. On March 21, the day the offensive started, the 3rd Battalion of the Tank Corps was at Bray-sur-Somme in the process of re-equipping with Whippets. A couple of days later, Bray was captured by the Germans and the 3rd Battalion pulled out, leaving behind some Whippets which were unserviceable due to "teething troubles" and which had to be blown up. On March 26, however, the Whippets made a decisive impact on the advancing enemy when twelve of these vehicles were rushed north to Hebuterne to cover a four-mile gap which had appeared in the retreating Third Army front. At Mailly-Maillet Wood they ran into a force of 300 German infantrymen whom they promptly charged and put to flight, capturing a number of the enemy in the process and preventing what could have been a major breakthrough. Whippets took part in several other skirmishes in the period immediately following this.

The great action, however, for ever associated with the Whippet tank was the Battle of Amiens on August 8, 1918, for this was the occasion when the Medium Mark A was first used in its designed role as a "cavalry tank" actually working with the cavalry. By this time the 3rd Tank Brigade (composed of the 3rd and 6th Tank Battalions) was fully equipped with Whippets, 96 in all, and was assigned to the Cavalry Corps. The plan was broadly that which had led to the inception and acceptance of the Whippet, the classic breakthrough with exploitation by the cavalry divisions and the tanks in the enemy's rear. In practice it proved convincingly that tanks and horses don't mix. The cavalry outstripped the tanks when there was no opposition, but had to wait for the Whippets to come up when enemy machine-guns were encountered. Liaison between the two arms was poor, the cavalry commanders were over-cautious, and a great opportunity to penetrate ten or more miles behind the enemy lines was lost. The Whippets, instead of being pushed forward en masse were largely wasted "wet-nursing" the cavalry.

Individual vehicles performed wonderful deeds, however, and one Whippet, "Musical Box" of 6th Battalion, commanded by Lieutenant C. B. Arnold carried out one of the most adventurous tank exploits of the war. Running ahead of the main body, Arnold and his crew took "Musical Box" on a nine hour rampage behind the German lines, shooting up gun crews from the rear, attacking groups of retreating infantry, running amok in a German hutted camp, attacking horse lines, and shooting up a transport column. Eventually "Musical Box" was knocked out and set on fire by an enemy field-gun, by which time Arnold and his crew had been reduced to wearing the mouthpieces of their respirators in order to be able to breathe in the petrol and cordite fumes which filled the vehicle. The driver was killed and Arnold and the gunner were captured.

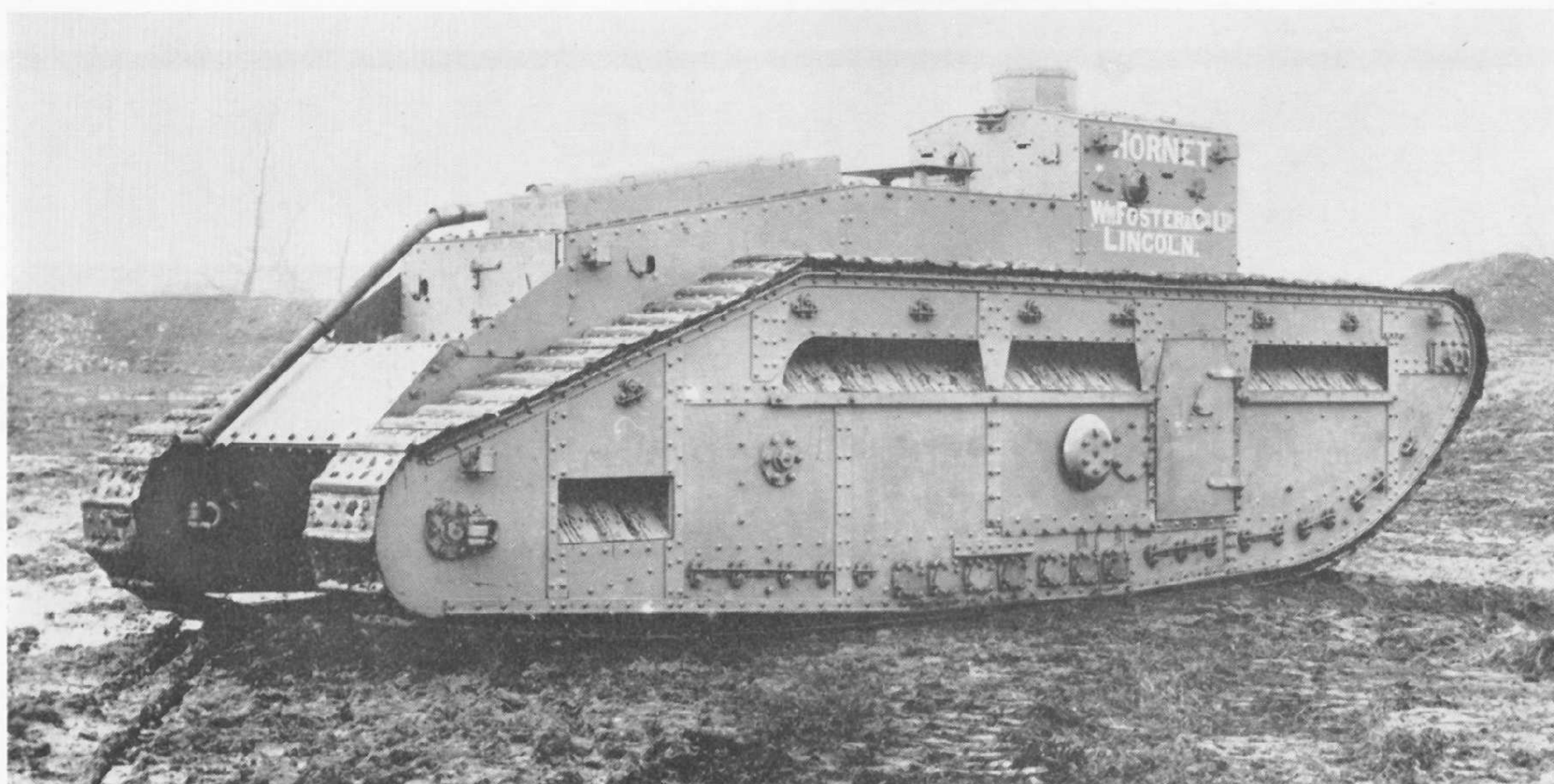
Later in August two VCs were won by Whippet commanders. At Fremicourt on August 29, Lieut. Sewell was awarded the VC for rescuing the crew of a knocked



out companion vehicle under fire, he himself being killed. Meanwhile the commander of the 6th Battalion, Lieut.-Col R. A. West, also won a posthumous VC rallying and leading his Whippets (and accompanying infantry) on horseback.

By the time of the Armistice the Whippet had indeed made its mark on the Western Front tank fighting and in popular imagination.

A few Whippets captured by the Germans were put back into service by them, one company being so equipped. In German service the Whippet was called "Beute Panzerwagen A" (Beute: captured). They



Above and facing page: *Foster's archive pictures of the Hornet (Medium Mark C) prototype in autumn 1918 when it was on test show clearly the physical characteristics of the design. Note the numerous and well-sited pistol ports and vision slots, the big mud chutes, the commander's cupola, and central driving position. (Imperial War Museum)*

played no important part in German tank fortunes, however.

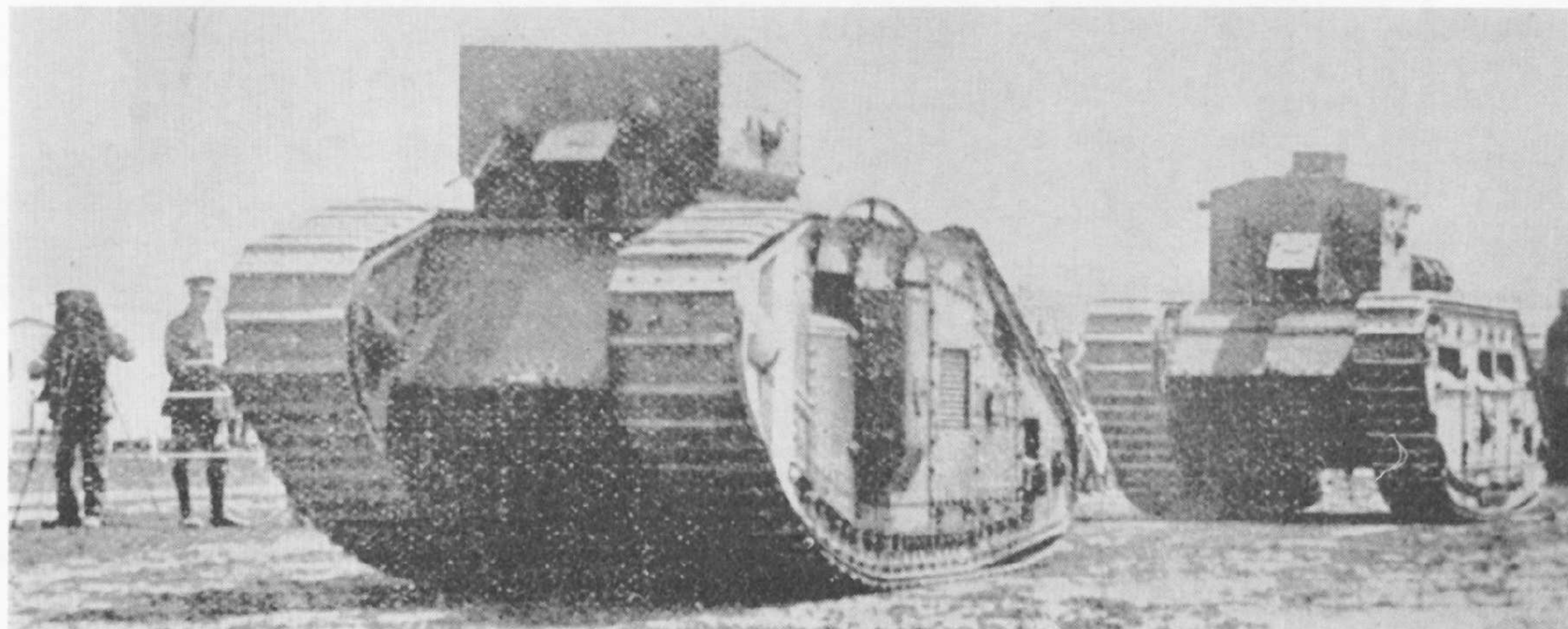
After the Armistice the Medium Mark A did not long remain in British service. The greatly depleted Tank Corps had a sufficiency of the later medium tank models to replace the Whippets for peacetime use, though a few Medium Mark A's saw extensive service in Ireland for a couple of years after the war during the time of the "Irish Troubles". These vehicles notched up very large mileages on patrol and "flag-showing" work and, always mechanically reliable, gave little trouble in the process. At least one Whippet at the Tank Corps Depot, Bovington, was converted to an armoured recovery vehicle in 1919 with its superstructure cut down and replaced by a swivelling crane. This vehicle does not appear to have survived long in service, however. Longest lived of all Medium

Mark A's were the batch of surplus vehicles sold to the Japanese in 1920. These survived in service until at least 1930, if not longer. The Whippet was, in fact, the first Japanese tank.

THE MEDIUM MARK B

A significant step forward in British tank development in World War I was the design of a new purpose-built tank engine to provide the power and flexibility required for improved performance. The original Daimler commercial motor used in the heavy tanks Mk I-IV was recognised from the start as inadequate for the task, but it had the advantage of being readily available in large numbers. By 1916, however, the Daimler Co. were fully committed to other production work, mainly aviation engines, and were not able to

Pictures of Medium Mark Bs in service are uncommon. Here a Medium Mark B from the Tank Corps Depot at Bovington takes part in a parade for the GOC Southern Command in May 1919. Following is a Medium C Hornet showing the similarity in general layout. (Tank Corps Journal)





Medium Mark C from front shows disposition of ball-mounts for guns and the numerous vision slots and pistol ports. Note also the refinement of hooded electric headlights. (Imperial War Museum)

devote their resources to the design and production of a more powerful tank engine. Early in 1917, therefore, Col. Stern of the M.W.S.D. looked for another solution to the problem of tank engine supply and called in Mr Harry Ricardo, a bright young motor engineer who already enjoyed considerable success in the commercial field. Ricardo's brief was to design a tank engine of at least 150 horse power, which could be tilted at angles of up to 35° and run for up to 100 hours without adjustment and with the minimum of smoke. It had to run on low grade petrol (gasoline), was to be as narrow as possible, but with less critical limits for height and length, and aluminium and high grade steels needed for aircraft and other war production were to be avoided where possible.

Ricardo took advantage of the almost unlimited height at his disposal to produce a design with long stroke pistons which had the little end of their con-rods running in cross-head guides. This reduced friction and hence oil consumption, thus greatly re-

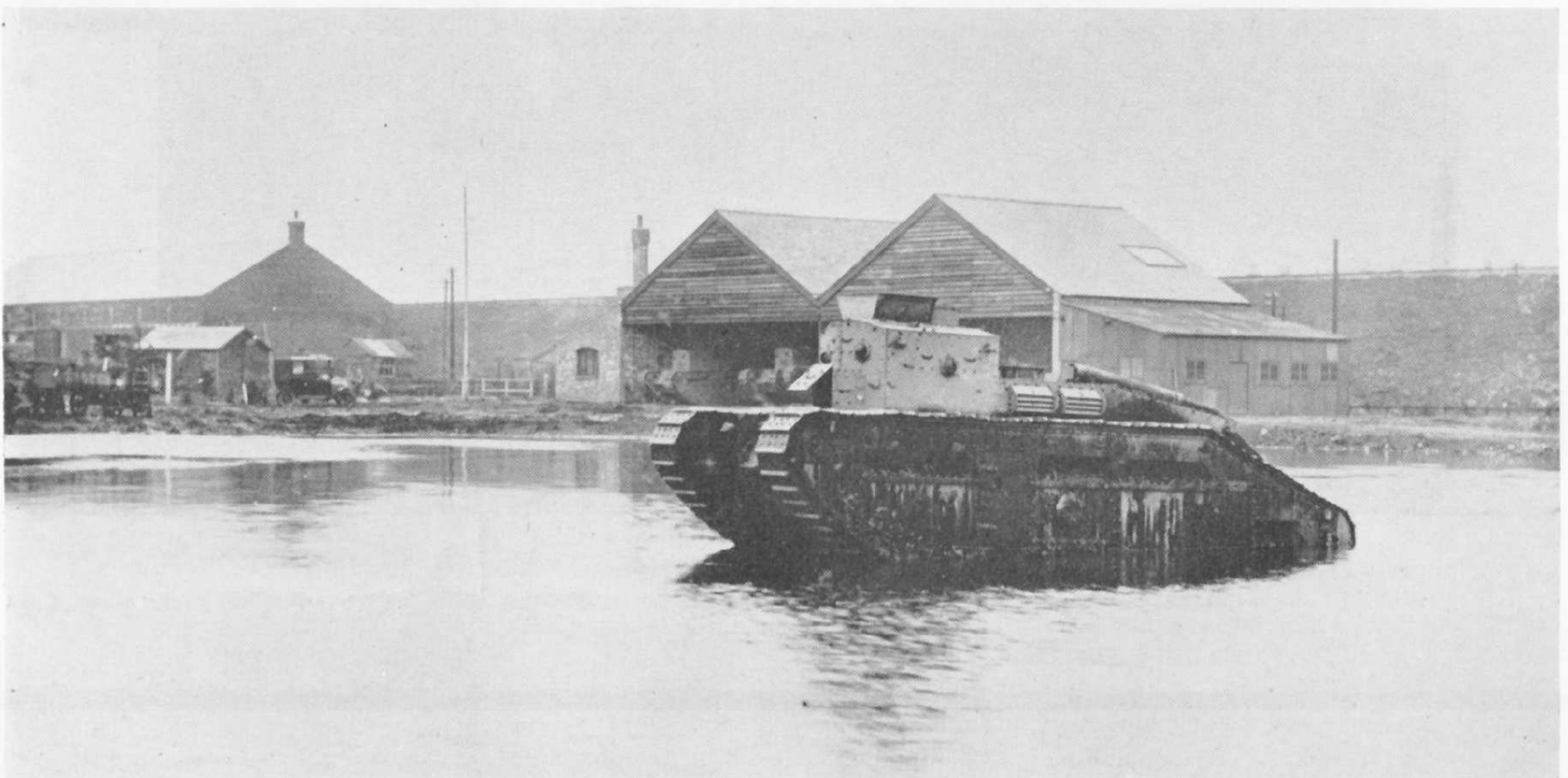


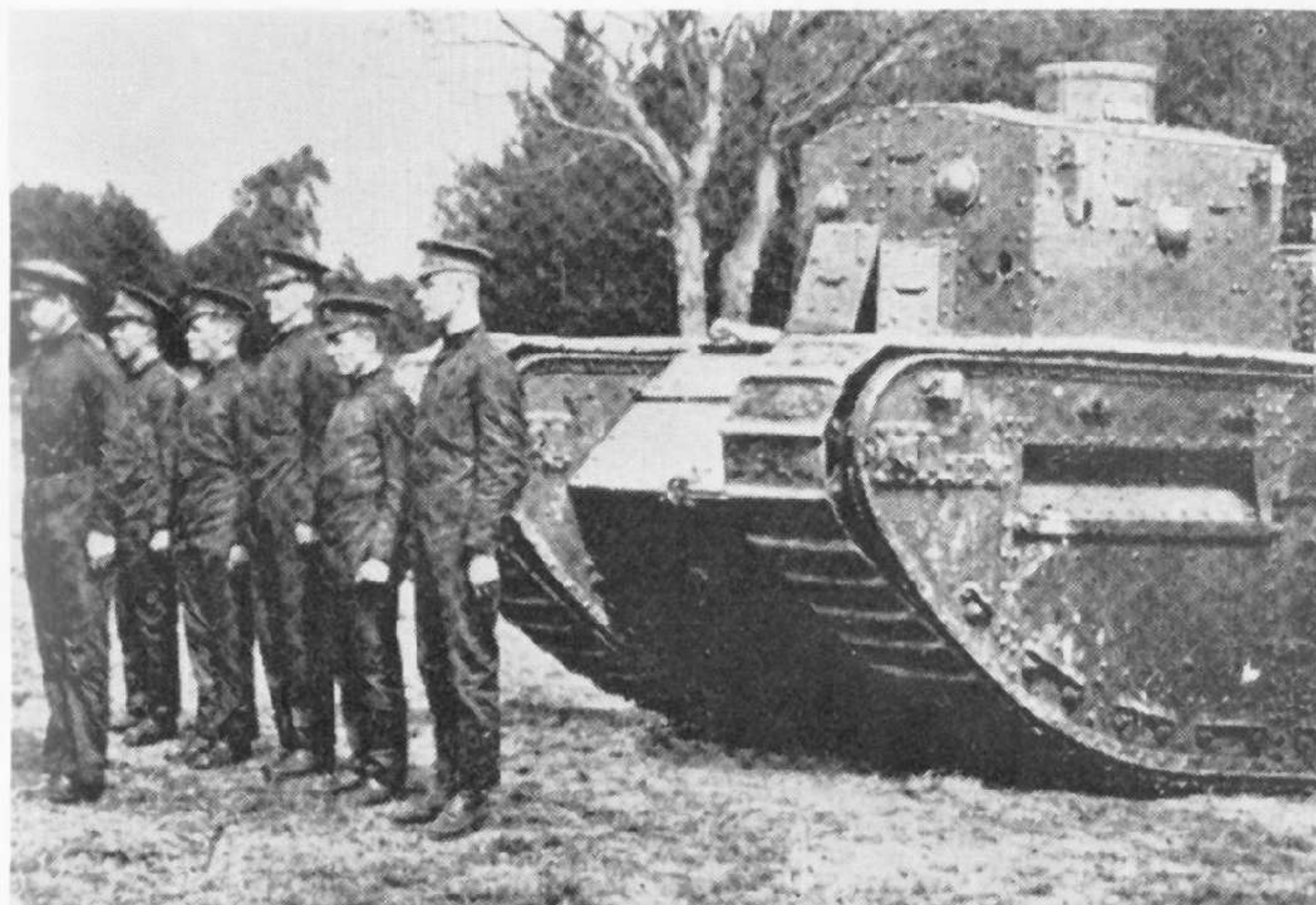
Medium C top decking. Armoured fuel tank is between rear horns and the panel with the radiator grille was a complete one-piece assembly. (Imperial War Museum)

ducing smoke from burning oil. Compression was on the low side (186 lbs per square inch) and maximum speed was 1,200 r.p.m. which gave a maximum output of 165 h.p. under test.

The completed design was sent by Stern to an independent expert for scrutiny. Following a very favourable report Stern immediately ordered 700 Ricardo engines at the end of January 1917 from five automotive firms, despite the fact that no designs for "second generation" tanks had until then been finalised. He aimed in this way to overcome any possible engine shortage at a later date such as plagued the aero industry at that time. Though the War Office prevailed

Production Medium Mark Cs under test at the Foster works. Local flooding gives an opportunity for a wading test while other Medium Cs can be seen in the sheds at the back. (Imperial War Museum)





Medium C crew line up for an inspection at Farnborough in 1920, four years before the Tank Corps adopted the famous black beret. (RAC Tank Museum)

upon the Ministry of Munitions to get Stern to cancel this "wasteful" order, Stern ignored such directives and promptly doubled the number.

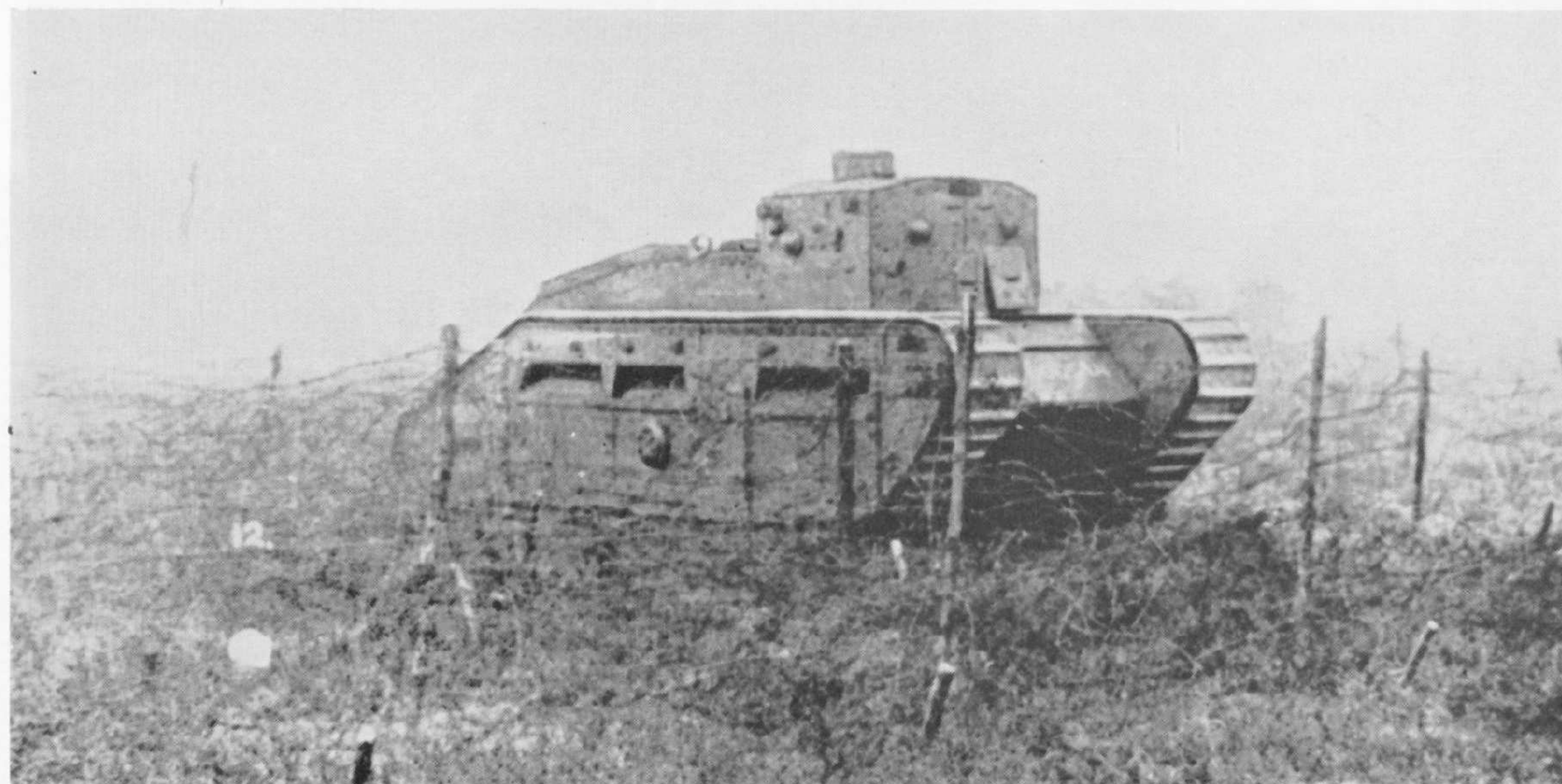
After the Oldbury demonstration of March 3, 1917, already described, an experimental fitting of an epicyclic gearbox in a heavy tank was eventually judged to be the most satisfactory form of transmission for future designs. This epicyclic gearbox was evolved by Major W. G. Wilson, who, with Sir William Tritton, had designed Tanks Mks I-IV. Wilson now went on to design a series of new tanks for the M.W.S.D. all based on his epicyclic transmission and the new Ricardo engine. Designs for two heavy tanks, the Mark V and Mark VI, were completed in July 1917 though the Mk VI was never put into production and the Mk V was not ordered until after the Battle of Cambrai in November 1917.

Wilson also designed a new medium tank as a pro-

posed replacement for the Medium Mark A. He envisaged using a superstructure something similar in arrangement to the Mark A's but utilising the rhomboidal shape and all-round tracks of the heavy tanks to overcome the poor cross-country performance which was already recognised as an inherent disadvantage of the Mark A. Work on the new design was completed late in 1917 and allowed for a "male" model armed with a 2 pdr. gun and machine-guns, and a "female" model with four Hotchkiss machine-guns only as in the Medium Mark A.

Designated Medium Mark B and, like the Medium Mark A, known as the Whippet, the new vehicle represented a considerable advance over any of Wilson's previous designs. The Ricardo engine was utilised but in a shortened 100 h.p. form with only four cylinders instead of six. The engine was, for the first time in a rhomboidal tank, set in its own rear compartment so sparing the crew from the effects of its heat and fumes. Drive was through a four-speed gearbox with cross shafts driving epicyclic gears which in turn drove the rear sprockets directly by chains. Track shoes and rollers were similar in pattern to those of the Mark A, but in all other respects the Mark B differed. The fighting compartment was at the front with two ball-mounts for Hotchkiss guns in the superstructure front and one in each of the other three faces. Access to the interior was through a door in each hull side, these doors being bulged outwards 9 inches and provided with pistol ports in each face, so formed to make possible close-in covering fire with the crews' personal weapons. There was a further ball-mount in each door as well. Radiator intakes, as in the Mk V heavy tank, were cut in the sides and there were mud chutes to clear the top run of the tracks. The driver sat centrally in front with controls similar to those in the Mk V and there was space for a commander and two gunners in the fighting compartment. A novel feature, based directly on combat lessons, was a smoke emitter of crude but effective type consisting of a reservoir of

Medium Mark C negotiates a barbed wire barricade during crew training at Bovington, circa 1920. (RAC Tank Museum)



sulphonic acid situated above the exhaust pipe. Provision was made for hand or electric starting and the rear decking was removable to give access to the engine.

An order for 450 Medium Mark B's was given in mid-1918, after some delay to make detail changes to the design and a little indecision on the part of the General Staff who waited to see how the Medium Mark A's were received before committing themselves to a successor. Metropolitan Carriage Wagon and Finance Co. of Wednesbury, Birmingham, received the contract for the Medium Mark B, but the Armistice in November 1918 led to cancellation of the order after only 45 vehicles had been completed. The first vehicle ran its trials in September 1918. Only the machine-gun armed "female" version was ordered for production.

In practice the Medium Mark B was found to be less promising than it appeared on paper. A major drawback was the inaccessibility of the engine, due to its being set in a separate compartment (divided off by a stout bulkhead) which meant that the rear decking had to be removed for any maintenance task, while the engine often had to be lifted out completely even for minor repairs due to the narrowness of the hull. Legend has it that a mechanic who tried to adjust the tappets on one of the first Mark B's got securely wedged inside the engine compartment and could not get out again until a salvage tank was brought up to remove the engine. It is fair to add that the cramped nature of the Medium B was not entirely the fault of the designer—he was working to the brief of the Tank Corps who, in April 1917, had asked that all future

Medium tanks should be designed to fit a standard railway flat car.

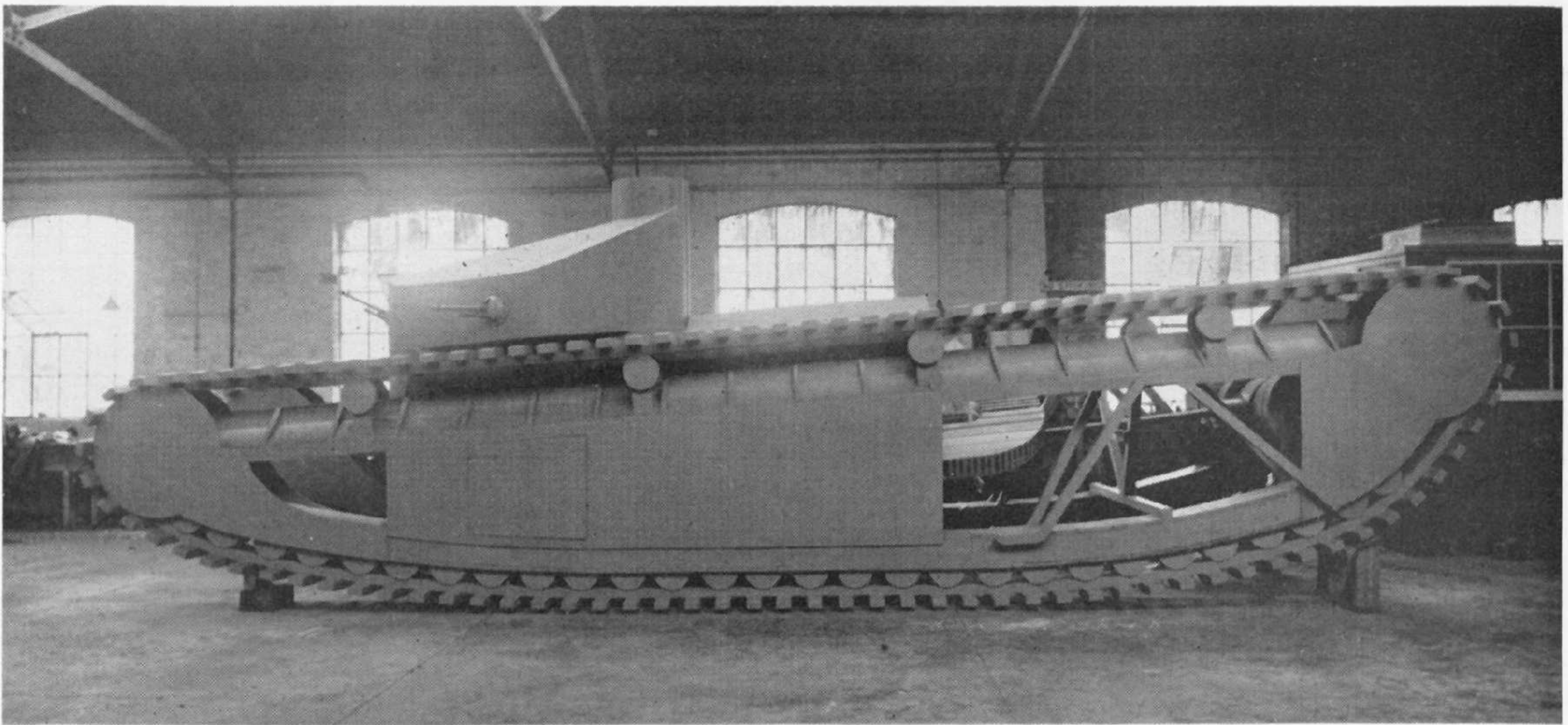
Some of the few Medium Mark B's produced were used for training at Bovington in 1919-21 and others, too late for action in the Great War, were sent to Russia with the North Russian Expeditionary Force in their attempt to hold the Bolsheviks at bay. A total of seventeen Medium B's were eventually serving in Russia, the first six arriving in May 1919. Some of these were later handed over to the Russians. Finally a few Medium B's were sent to the 17th Bn. Tank Corps in Ireland late in 1919, together with Mk V's, to replace that unit's obsolete Mk IV tanks.

THE MEDIUM MARK C (HORNET)

While Wilson was working on the Medium Mark B, Sir William Tritton was also designing a new medium tank to replace the Mark A. Called the "Hornet" by Tritton it was later officially designated Medium Mark C. Like Wilson, Tritton made every effort to incorporate all the lessons learned from battle experience into his new design—even to the extent of canvassing Tank Corps men who had fought in tank actions such as Cambrai. In general layout the Hornet resembled the Medium B in that it had a rear engine, overall tracks, and a raised forward fighting compartment. Completed in December 1917, the design offered two models, a "male" with single 6 pdr. gun in the hull front and a "female" with Hotchkiss machine-guns only. The full 6 cylinder Ricardo engine was used but this time reversed so that the gearbox was in front with cross shafts to the epicyclic gears. There was chain

Four Medium Cs represent the Tank Corps in the Victory Parade in London in 1919. They are seen with marching Tank Corps men on Westminster Bridge. (Imperial War Museum)



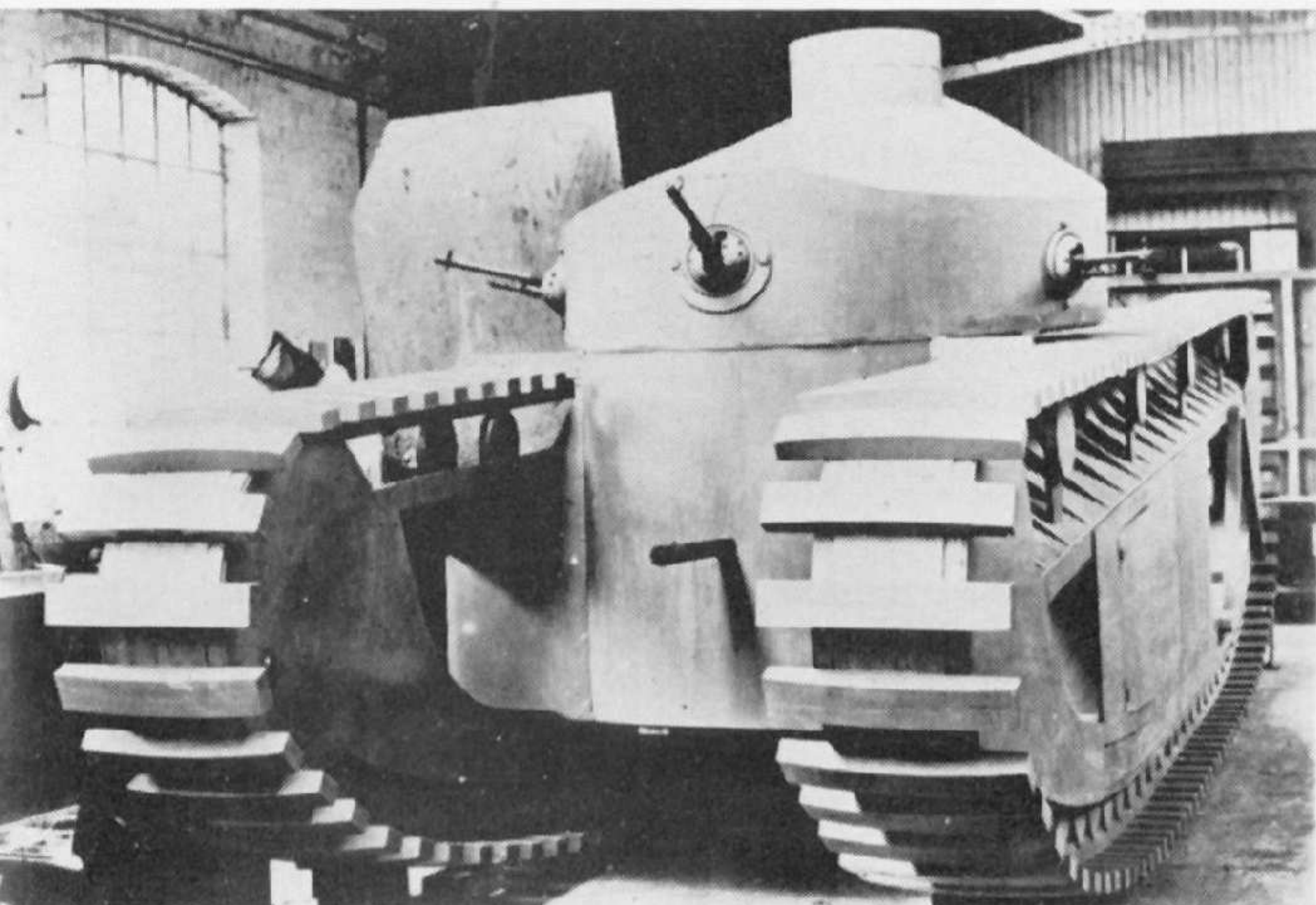


Full-size wooden mock-up of the Medium Mark D as it appeared in November 1918. Note the single cupola for the commander/driver. (Imperial War Museum)

drive via an intermediate pinion to the rear sprockets, and special emphasis was given to providing adequate access to the engine and transmission from inside the vehicle.

Notable points about the Hornet were the efforts made to improve habitability for the crew and the concentration in designing the vehicle from the start for mass production with all major components arranged as sub-assemblies. There were no less than eleven vision ports, some of which doubled as pistol ports, plus a commander's cupola in the roof at the rear of the fighting compartment. Included internally was a map table for the commander, stowage facilities for crew equipment, voice-pipes for internal communication, a compass, and a mileage recorder. Cooling and ventilation were effected by a radiator and two large fans in the hull roof immediately behind the fighting compartment. Fuel was carried in a 150-gallon tank at the rear with Autovac pump, and a similar smoke screen emitter, activated by the exhaust, was fitted as described for the Medium B. Crew consisted of a

Another view of the Medium D mock-up from the front. The dummy gun mounted low in the hull is thought to represent the position of the 6 pdr. gun for the proposed "male" version. (Imperial War Museum)



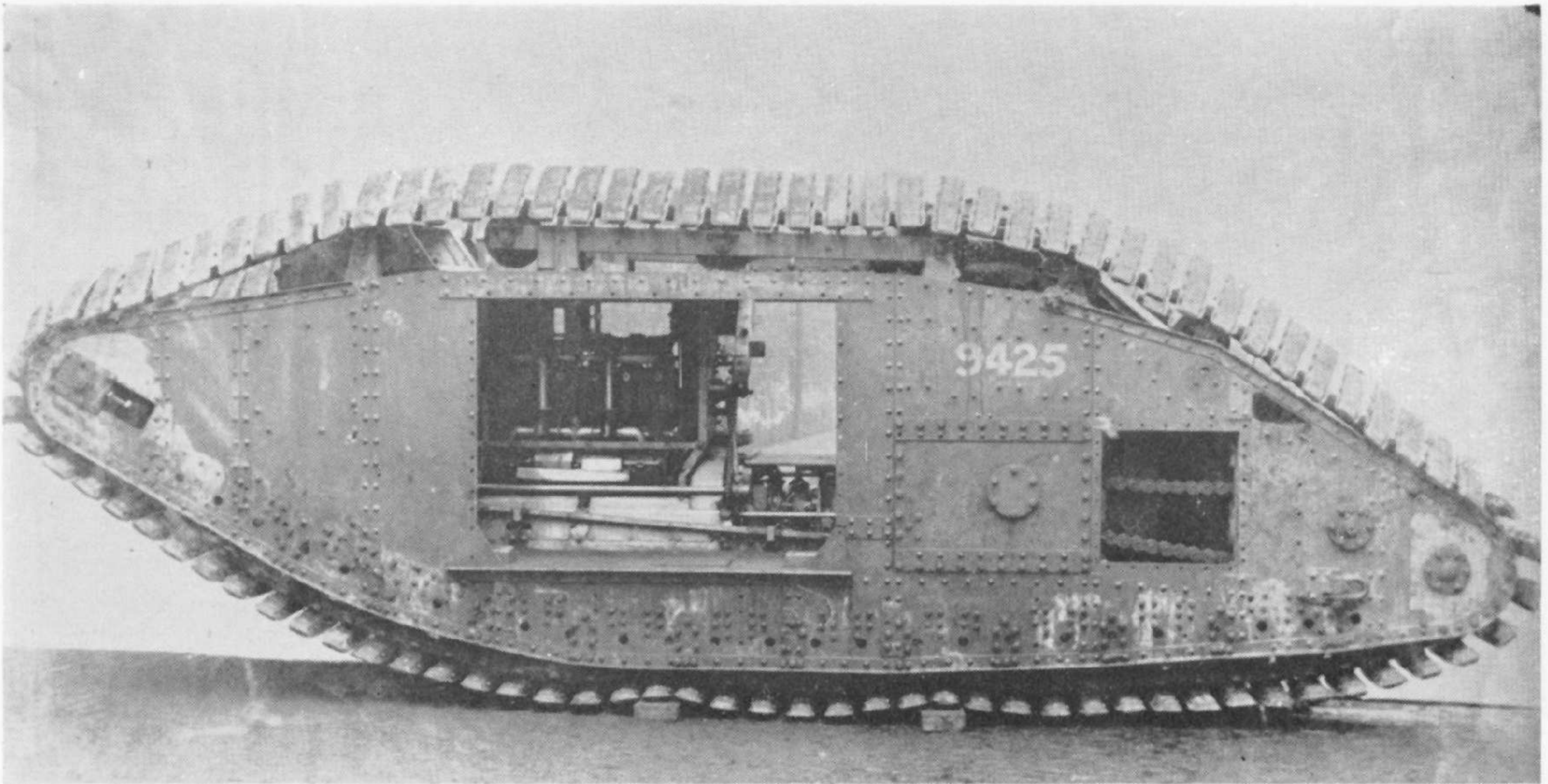
commander, driver, and two gunners. Access was via side doors but there were no sponsons.

Prototype of the Medium C was completed at Foster's works in the summer of 1918 and trials were most successful with almost 1,000 miles of nearly trouble-free running. At the beginning of October 1918 an order for 200 vehicles was placed, all of the 'female' type. The "male" type proved unsatisfactory due to the limited traverse of the front-mounted 6 pdr. gun. The production contract went to Foster's, Tritton's firm, but only 36 were under construction by the time of the Armistice in November 1918, and the contract was cancelled save for the first 48 vehicles.

With a top speed of 8 m.p.h. and an excellent power to weight ratio, the Medium C was the finest British tank design to appear in World War I. Too late for war service, Medium C's were issued to various tank battalions in small numbers and became the "backbone" of the Tank Corps until 1924-25 when they were replaced by the new Vickers Light (later redesignated Medium) tanks. To the public they were familiar as the tanks which represented the Tank Corps in the Victory Parade in London in 1919, and they were equally well-known at the scene of the major strikes of 1919-20 when military intervention was thought necessary. But they never fired a shot in anger.

"PLAN 1919" AND THE MEDIUM MARK D

Had the war continued, the Medium C would have been a very important vehicle indeed. Provisional plans had been made to produce 4,000 female and 2,000 male types in 1919 to meet Tank Corps requirements. Meanwhile the quest for a much faster type of medium tank had begun to dominate Tank Corps staff thinking. First steps in this direction had been taken late in 1917 when Major Philip Johnson, an Army Service Corps officer involved in tank maintenance and servicing since 1916, suggested the idea of fitting springing to a Medium A Whippet tank in an attempt to improve performance qualities. Johnson was an inventive and energetic man, then commanding one of the tank workshop companies in France. He



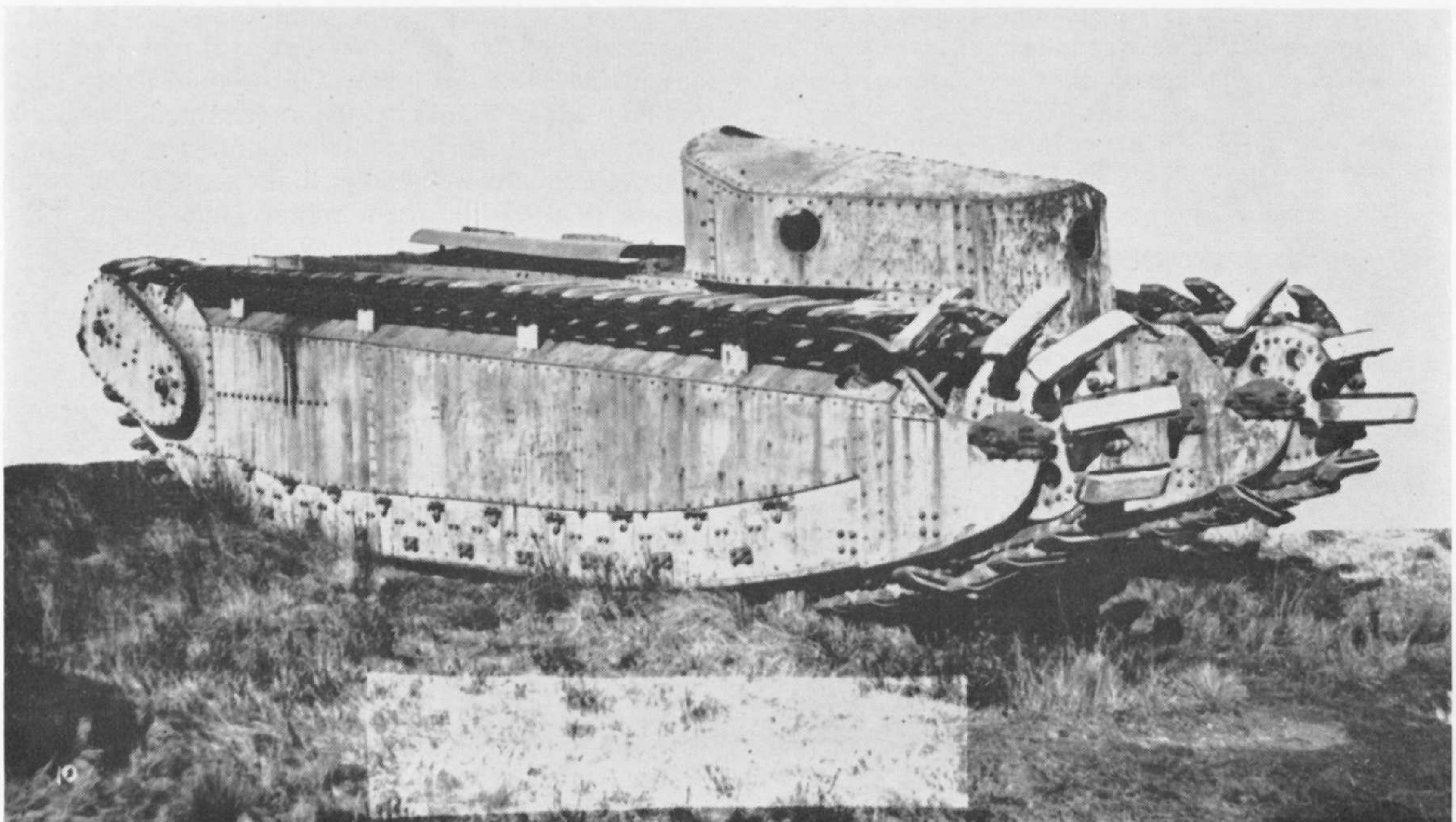
The Mark V test vehicle for Johnson's flexible "Snake" tracks. Vehicle has been lightened by removal of sponsons and other non-essential equipment. (Col. R. J. Icks Collection)

fitted sprung rollers (with leaf springs) to a Whippet in place of the original rigid rollers. This showed a distinct improvement in running, and Johnson's next step in February 1918 was to replace the two Tylor engines of the vehicle with a Rolls-Royce aero engine and the complete epicyclic transmission from a Mk V tank. Considerable alteration to the vehicle was necessary to achieve this, including a raised superstructure. So fitted, the vehicle gave an impressive performance reaching speeds of 20-30 m.p.h.

Resulting from this, Colonel Searle, chief engineer of the Tank Corps, discussed with Colonel J. F. C. Fuller, GSO 1 of the Corps, the possibility of developing

faster tanks. In May 1918, Colonel Fuller produced a now historic staff paper "The Tactics of the Attack as Affected by the Speed and Circuit of the Medium D Tank"—better known as "Plan 1919"—in which he postulated a massive breakthrough by heavy and medium tanks on a 90-mile front. New types of heavy tanks then under development (Mk VIII, V**, etc.) would be used, with a "pursuing force" of medium tanks, Medium C's and the as yet non-existent Medium D which Fuller envisaged as a vehicle in the 20 m.p.h. class. The attack would be supported by aircraft and lorried infantry, in fact all the ingredients of what was later known as a "blitzkrieg". This suggested plan of a

*The Medium D**, seen derelict in the 'twenties after work on these tanks was abandoned. Cupola and gun mounts have been removed. Compare with mock-up illustration. (Imperial War Museum)*



big tank offensive for the following year was sent to the British General Staff and favourably received.

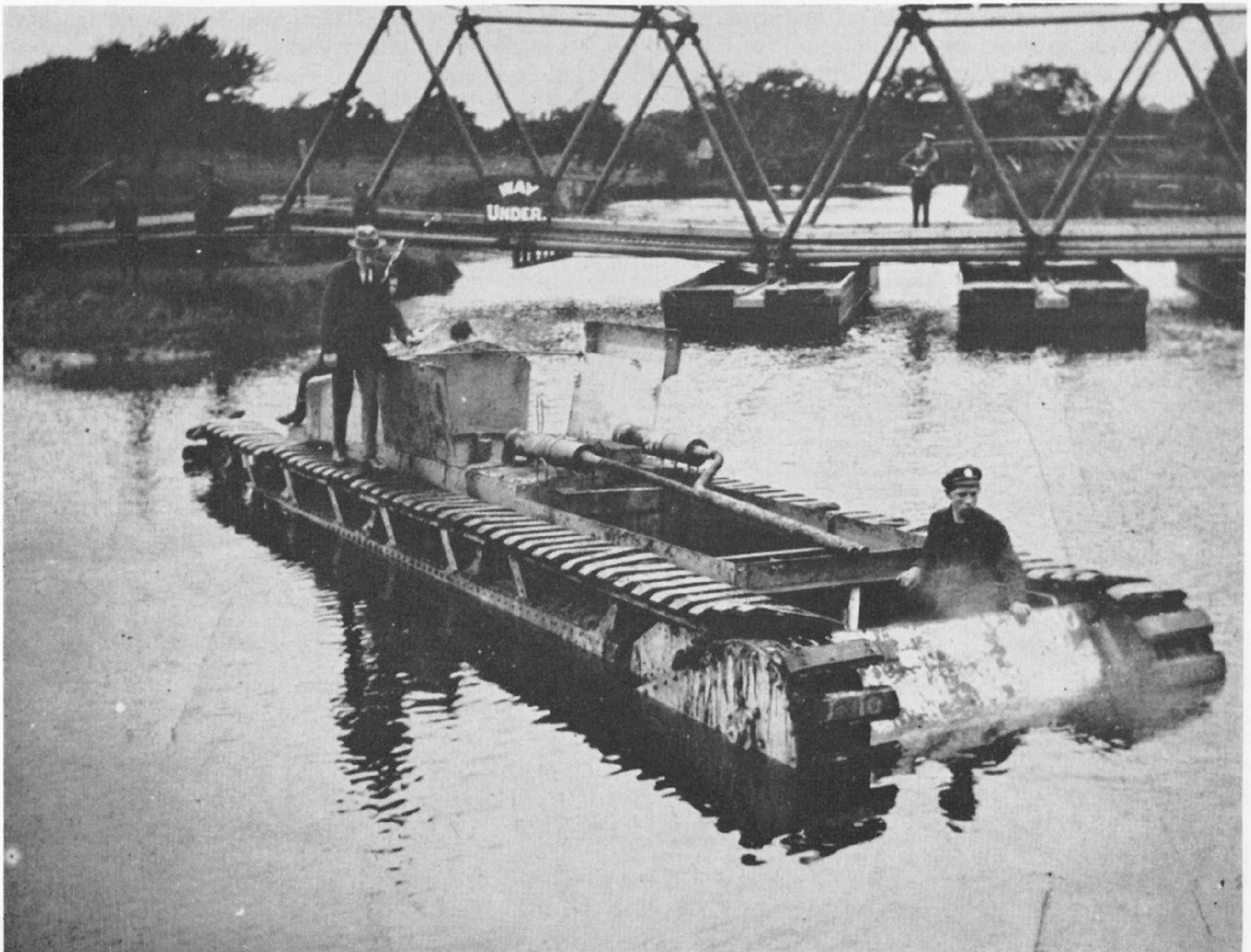
Johnson was asked to produce a design to match the requirements for the "Medium D" outlined in "Plan 1919" and suggested that sprung flexible tracks and an aero engine should form the basis. Promoted Lieutenant-Colonel, he was sent to England in charge of the Tank Corps Experimental Station at Dollis Hill with a brief to do the necessary development work and complete detailed designs. By the time of the Armistice in November 1918, a full-size wooden mock-up was under construction and plans were almost ready. To produce a satisfactory sprung track Johnson proposed to use steel cable suspension for the road wheels and a flexible track free to move in two planes. Each shoe pivoted on a hollow tubular connecting link which was joined by a sealed "ball and socket" to the next link. Oil for lubrication was carried in the hollow link and the whole system was somewhat analogous to an animal backbone in its freedom of movement. The idea of this was that in a fast turn the track would curve to follow the change of direction with no need for a "skid turn" and consequent temporary loss of power as with conventional tracks. In addition, of course, the flexible track would be infinitely superior over uneven surfaces. Johnson considered that a speed of 25 m.p.h. would be possible in the Medium D design.

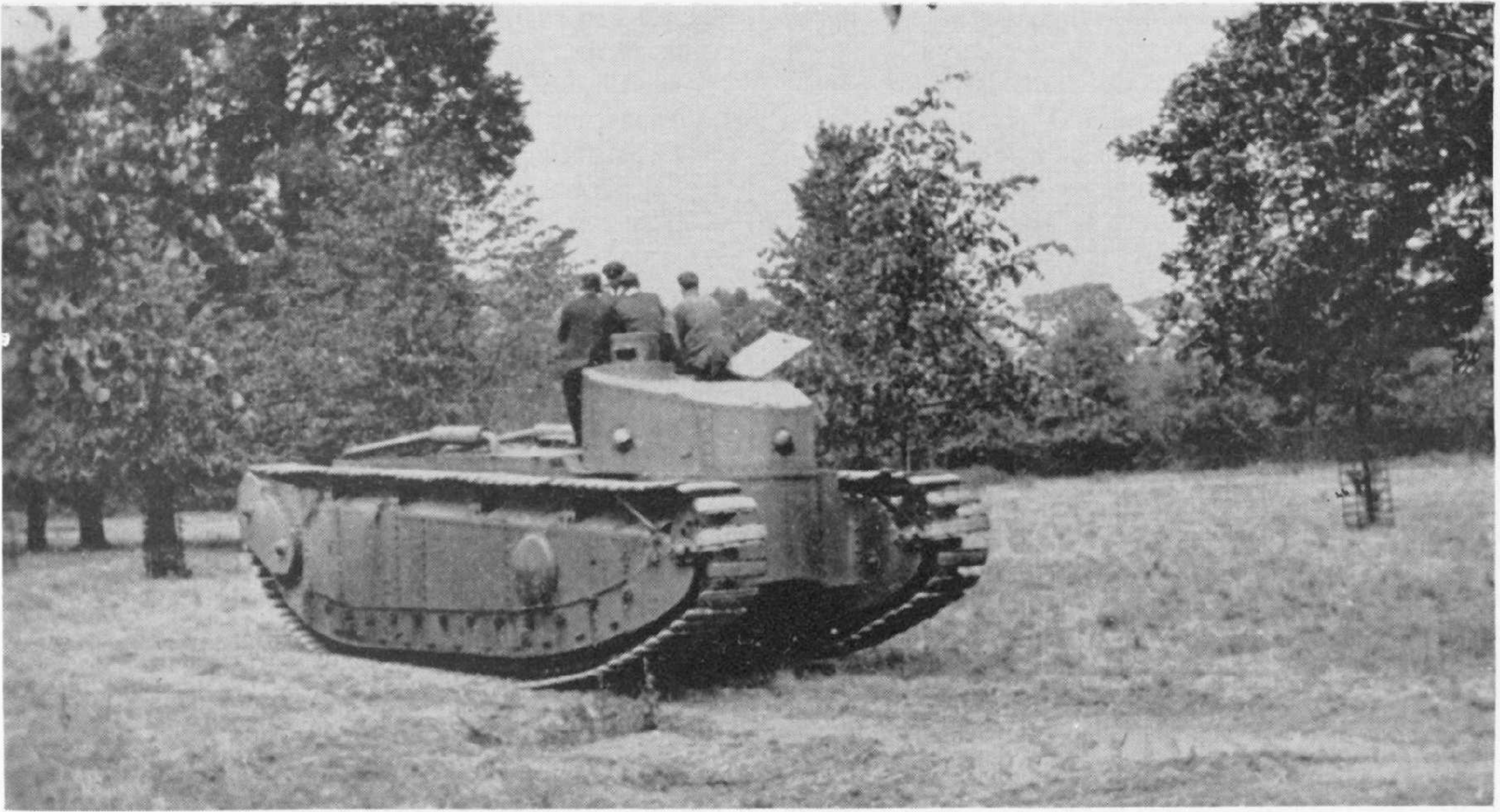
Immediately after the Armistice the War Cabinet

decided to suspend or cut back tank production and tank projects, but the Medium D was partially re-prieved by the intervention of Mr Winston Churchill, at that time Minister of Munitions and then (for a few weeks) Secretary of State for War, and by Colonel Fuller. Johnson meanwhile had a prototype set of flexible "snake" tracks made by Fowler & Co. of Leeds and they were tested on a modified Mark V tank in May 1919 with great success, the vehicle achieving a speed of nearly 20 m.p.h. Funds for the production of up to 45 Medium D tanks were granted, with an initial batch of twenty vehicles. Production was to be undertaken by the Woolwich Arsenal, though the first prototype was built by Fowler and tested at the end of May 1919.

In the Medium D, Johnson had broken with all past conventions. Power was provided by a 240 h.p. Armstrong-Siddeley Puma aero engine sited at the rear and the track outline was lower at the front than the rear, the idea being to give better forward vision and unimpeded fields of fire. A "female" version was to have three Hotchkiss machine-guns and a "male" version was to have a central 6 pdr. in the front and two machine-guns. In fact such details never got incorporated in the few models produced since there was much indecision in the Tank Corps as to how the fighting compartment should be laid out. Johnson, for instance, had placed the commander beneath a cupola at

*Medium D** seen on amphibious trials at Christchurch, Hants, in 1921. (RAC Tank Museum)*





Medium Mark D Modified running trials at Woolwich in 1921. (RAC Tank Museum)

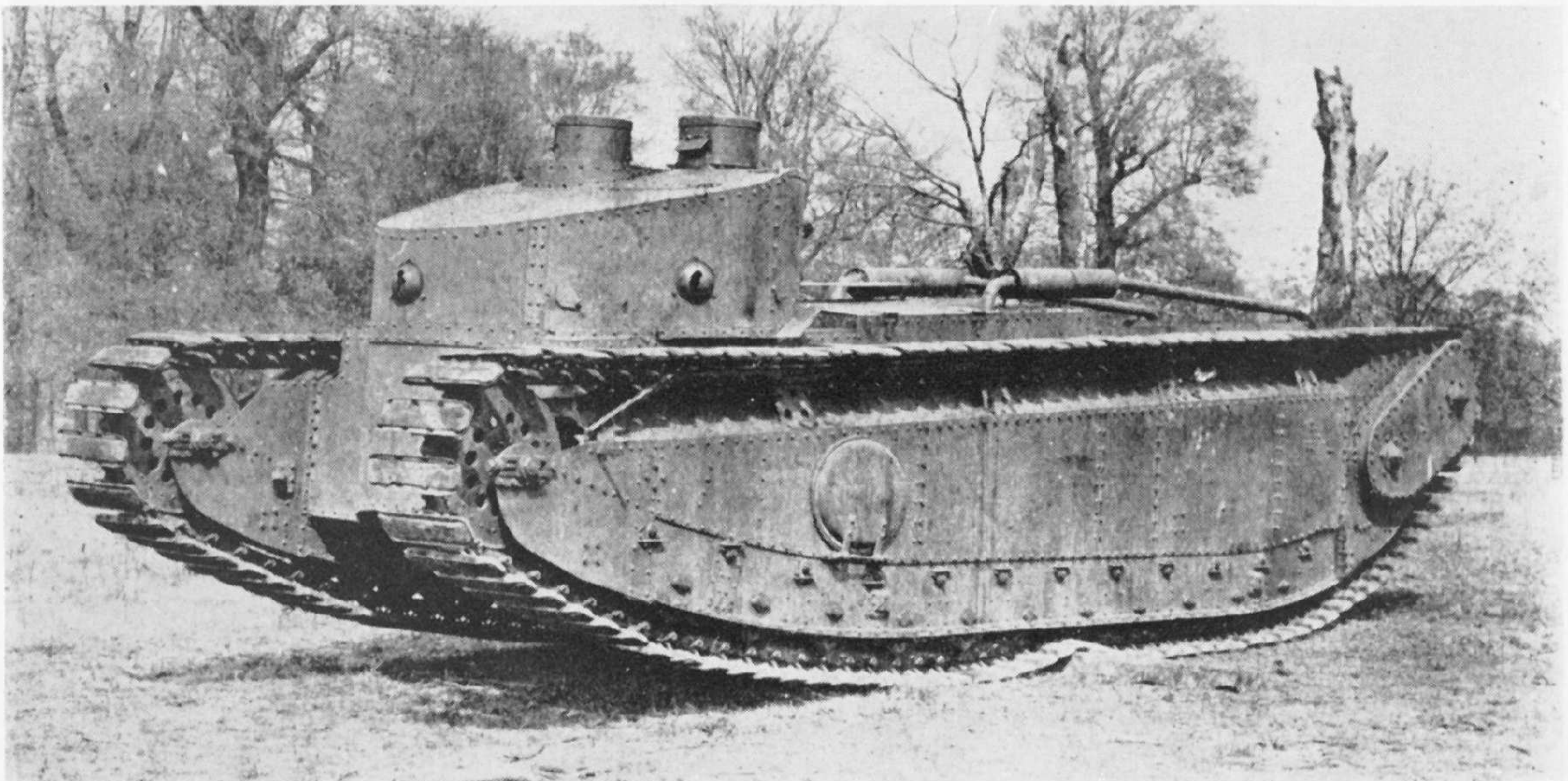
the rear and made him the driver as well, an arrangement not liked by General Elles the Tank Corps commander. Revisions were asked for to allow for a separate commander and driver but this was too late to affect the first twenty vehicles.

In all four prototypes were built, the second and third being constructed by Wolseley at Birmingham. One was taken to India by Col. Johnson for tropical trials in December 1919, while the other was modified to float, propelling itself by its tracks, and was tested at Christchurch, Hants, with great success. On another test in the Thames at Woolwich, however, this "amphibious" Medium D foundered. In its amphi-

bious form the vehicle was designated Medium D**. The fourth prototype built at Woolwich Arsenal was the Medium D Modified and incorporated design changes to meet Tank Corps requirements.

In 1921 Johnson designed a slightly smaller vehicle closely based on the Medium D called the "Johnson Light Infantry Tank" designed to provide machine-gun support for infantry attacks. It had an American Hall-Scott aero engine, weighed 8 tons, was 21 feet long, and had very thin armour. Though it too was amphibious and had a speed of 30 m.p.h., the vehicle—which was designed to meet a War Office requirement—did not progress beyond test stage, largely it is

Medium Mark D Modified was a slightly altered vehicle incorporating changes asked for by the Tank Corps. Note the side escape hatch and the two cupolas. It is believed that the second cupola was provided for the driver when the driving function was taken away from the commander at General Elles' request. (RAC Tank Museum)





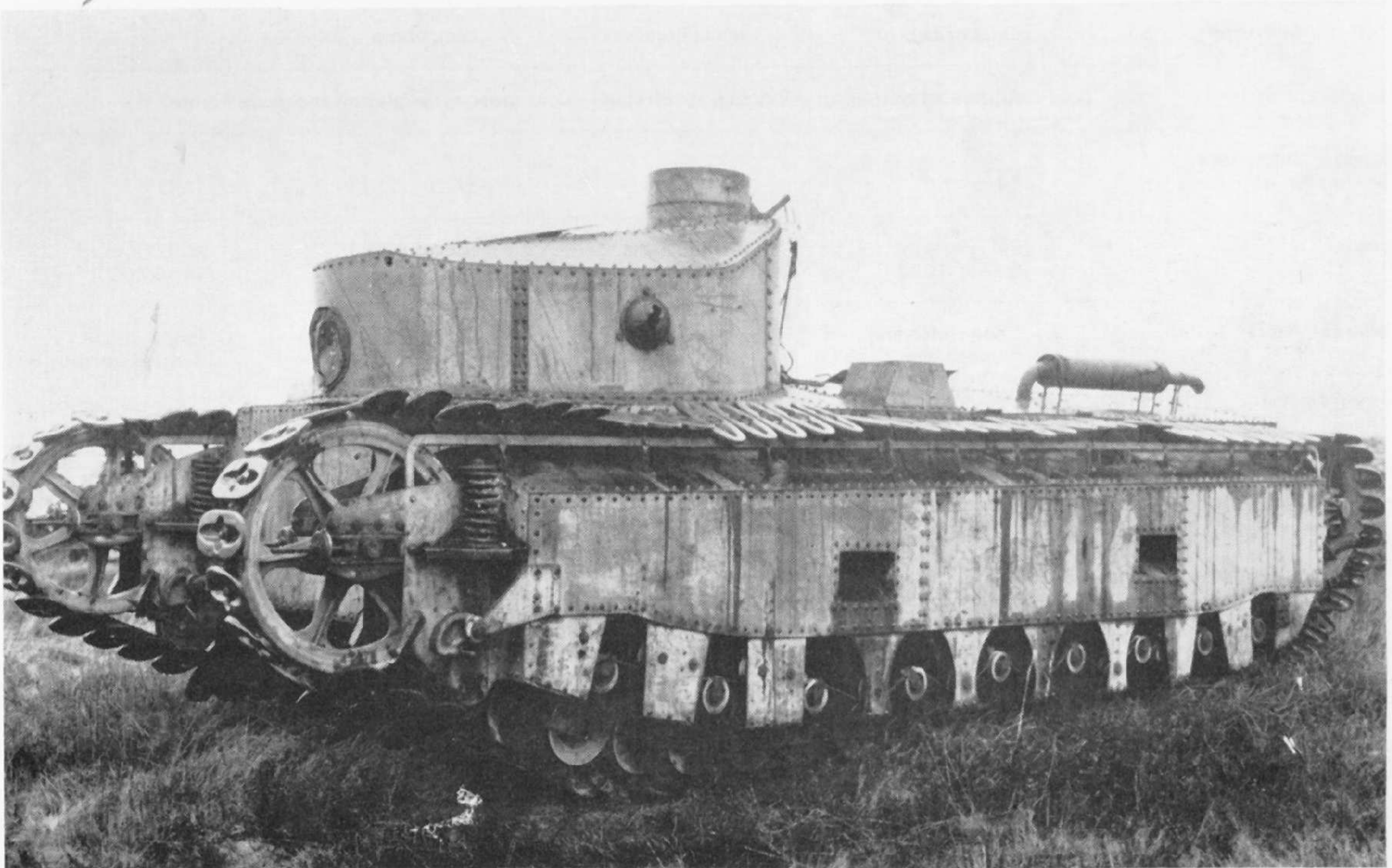
Rare picture of Johnson's Light Infantry Tank on amphibious trials in Fleet Pond, near Aldershot, 1922. (R.A.C. Tank Museum)

thought, because of the financial stringency of the time.

There were numerous "teething troubles" with the Medium D design which were never fully overcome.

There was a tendency to shed the track in high speed turns, and the transmission frequently developed faults due to the high power and torque in what was

Johnson's Light Infantry Tank bore a strong resemblance to the Medium Mark D though much smaller. Flexible tracks (differing in pattern from those on the Medium D) are well shown in this view. (Imperial War Museum)



essentially an over-powered vehicle. Much time was spent in maintenance and altering detail designs and the first two production Medium D's (to the original design) were not delivered (to the 2nd Battalion, Tank Corps) until July 27, 1921. Plans were now made to equip two battalions with Medium D's, though General Elles still considered the design wholly unsatisfactory for service. However, just about that time the prototype Vickers Light (later Medium) tank appeared, designed under the auspices of the Master General of the Ordnance, and this sounded the death-knell of the Medium D. In July 1922 when the development bill for the Medium D had reached £290,000 with few production vehicles to show for it and numerous mechanical problems unresolved, the Chief of the Imperial General Staff asked for the entire programme to be wound up as an economy measure. Johnson and his staff at Dollis Hill had, meanwhile,

been demobilised in 1920 but carried on their design work as civilians in the Tank Design Department. In 1923 this department was itself closed down as an economy measure and Johnson started in commerce as the founder of the well-known firm of Roadless Traction Co. The files on the Medium D were finally closed on August 10, 1924.

By then the Vickers Medium tank was coming into service, a design which, if not outstanding, was trouble-free and considered well ahead of contemporary foreign tanks. The Medium D vehicles and the bright tactical thinking which had sired them had been ahead of their time. In the immediate peacetime years ideas for fast tanks and tactics to go with them did not often gain the support of the Generals. It took another war to teach the lessons over again.

A.F.V. Series Editor: DUNCAN CROW

SPECIFICATION: MEDIUM TANKS MARKS A - D

General	Mark A	Mark B	Mark C	Mark D
Crew:	3-4	4 (commander, driver, gunners (2))	4	4
Weight: (tons)	14	18	20	20
Power/Wt. ratio: (b.h.p./ton)	6.43	5.5	7.5	12
Ground pressure: (lbs/sq. in.)	15.8/4.5	14.8/5.3	12.5/3.9	?
Dimensions				
Length: (ft.)	20	22 $\frac{3}{4}$	26	30
Height: (ft.)	9	8 $\frac{1}{2}$	9 $\frac{1}{2}$?
Width:	8'7"	8'10"	8'4"	9'2"
Track width: (inches)	20 $\frac{1}{2}$	22 $\frac{1}{2}$	20 $\frac{1}{2}$	20 $\frac{1}{2}$
Armament:	3 x Hotchkiss MG	4 x Hotchkiss	4 x Hotchkiss	3 x Hotchkiss (not finalised)
Ammunition: (rounds)	5,400	7,500	7,200	?
Sighting/vision:	Pistol ports and vision slots in all			
Communications:	pigeon/flags	semaphore	cupola semaphore	cupola ?
Construction:	All-riveted armour cut and drilled as soft steel—then hardened; angle iron and girder frames			
Armour Thickness: max/min (mm):	14/5	14/6	14/6	10/8
Engine: H.P./r.p.m.:	2 x Tylor 4 cyl 2 x 45/ 1000	Ricardo 4-cyl 100/1250	Ricardo 6-cyl 150/1250	A-S Puma 240/2000
Transmission:	Cone clutch and 4-speed box each engine	Epicyclic and 4-speed gearbox with chain drive	Epicyclic and 4-speed gearbox with chain drive	Epicyclic and 3-speed gearbox
Suspension:	Unsprung rollers	Upsprung rollers	Unsprung rollers	Cable springs and flexible track (‘Snake’)
Performance:				
Maximum speed: (top gear) (m.p.h.)	8.3	6.1	7.9	25
Trench crossing: (feet)	7	8 $\frac{1}{2}$	10	10 (approx)
Radius of action: (miles)	80	65	140	200 (approx)
Fuel: (gallons)	70	85	150	?
Special features:	—	Electric or hand starting	Rotating cupola for commander	Modified had second cupola: amphibious design
Builders:	Foster & Co	Metropolitan Carriage Wagon & Finance Co.	Foster & Co	R.O.F. Woolwich.

AFV

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3	Tanks Marks I–V	18	PanzerKampfwagen 38(t)
4	Stuart/Honey	19	Armoured Cars—Guy, Daimler, Humber
5	Light Tanks Marks I–VI	20	Sherman '75'
6	Valentine—British Infantry Tank Mark III	21	French Mediums
7	Mediums Marks A–D	22	T-54/T-62
8	Crusader—Cruiser Tank Mark VI	23	LVT I–IV
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