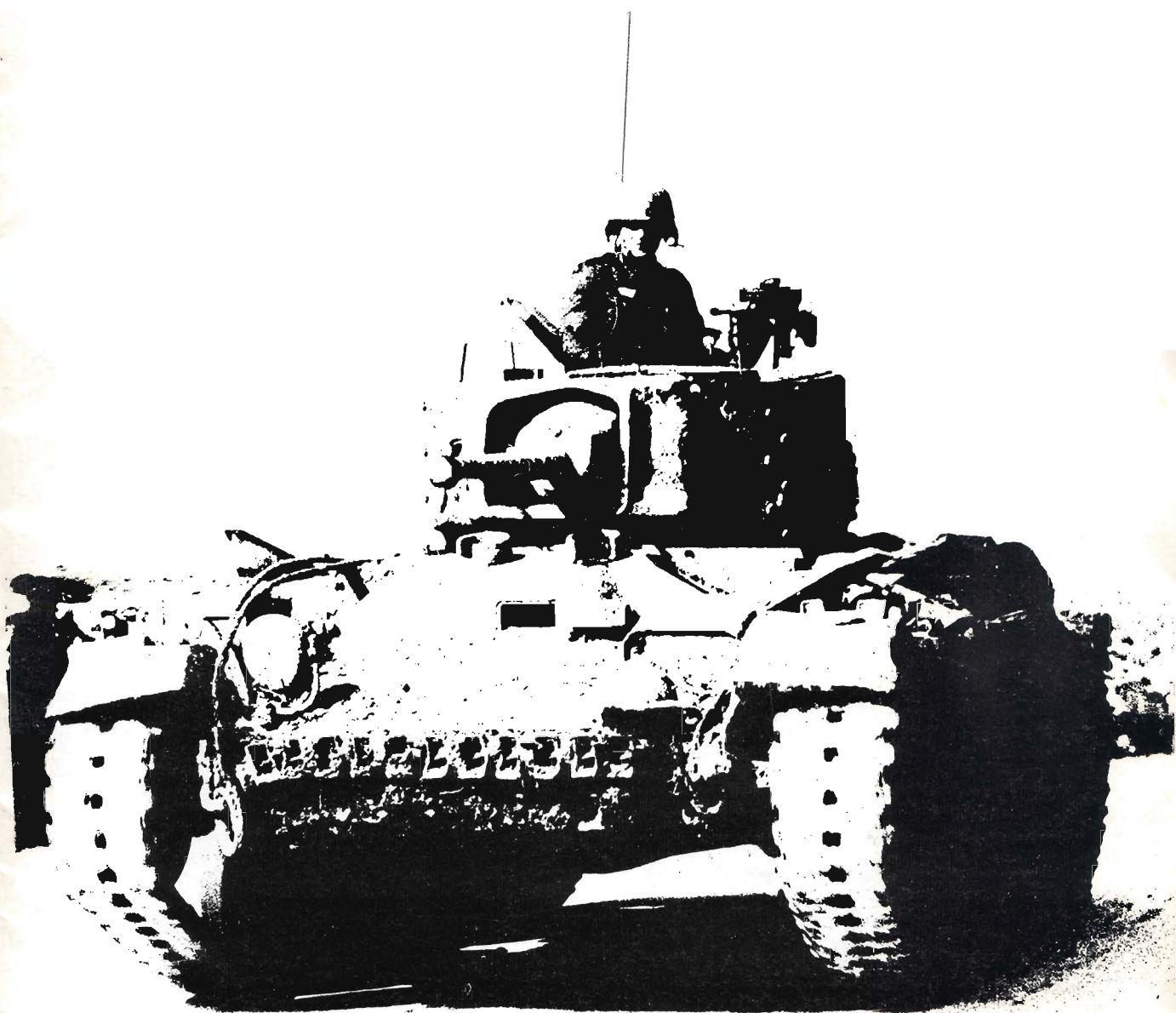


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VALENTINE MARK III

F 45p
Profile GS





Valentine II of the 50th Royal Tank Regiment near the Mareth Line, Tunisia in March 1943. (Imp. War Mus.)

Valentine, Infantry Tank Mk III By B. T. White

“The Brigade must have fired some of the last shots in the African campaign for it was on May 12 1943, that 23rd Armoured Brigade, led by 40th Royal Tank Regiment made physical contact with the leading troops of 6th Armoured Division of British First Army. . . . The Brigade was the armoured spearhead of 30th Corps and 13th Corps and after El Alamein, from El Agheila onwards, they constantly led the way along the one and only road. One of the noteworthy features, which speaks volumes for itself is that many tanks in 40th R.T.R. covered more than 3,000 operational miles on their tracks and many in the 50th R.T.R. closely followed this record, which, to men who know and have fought in armour, is a tribute to the Brigade’s work which needs no emphasising.” (*Brief History of the 23rd Armoured Brigade, 1939–1945.*)

ALL the tanks of 23rd Armoured Brigade were Valentines. This well-proven British tank, available in good supply by 1942–1943, was able to play a prominent part in the later stages of the campaign in North Africa thanks to design work which had its origins some eight years earlier and to consistent development by the industrial concern most closely associated with British tanks—Vickers Armstrong Ltd.

DEVELOPMENT HISTORY

On St. Valentine’s Day, 1938, the proposal by Vickers-Armstrong Ltd. for a new infantry tank had been deposited in the War Office.

The design was a private venture by Vickers—it had not been called for through the usual medium of a General Staff specification—and so had no “A. number” for a handy designation, and the name Valentine was chosen as a convenient and appropriate title. Valentine was also, incidentally, the second name

of Sir John V. Carden, whose genius was responsible for many tank designs including the immediate ancestors of the Valentine.

Two early Vickers cruiser tanks, the A.9 and A.10, must be mentioned here for the part they played in the evolution of the Valentine. A.9 was the General Staff specification for a simpler and cheaper medium tank than the famous Vickers “Sixteen tonner” (A.6) which was acknowledged as a very good tank but was frighteningly expensive at around £1,000 a ton.

The Army budgets of the 1930s gave little hope of the extensive re-equipment needed for the Royal Tank Corps at this cost (in fact, apart from the three experimental A.6s only three service vehicles—Tanks, Medium Mk. III—were built) and the A.9 specification drew up the essentials in armament, protection and performance for a more modest vehicle of around 12 tons using a commercial engine. The tank to meet these requirements was designed by Sir John Carden of

An A.9 (Tank, Cruiser Mark I) of ‘C’ Squadron, 1st Royal Tanks, 7th Armoured Division, 1940. (Imp. War Mus.)





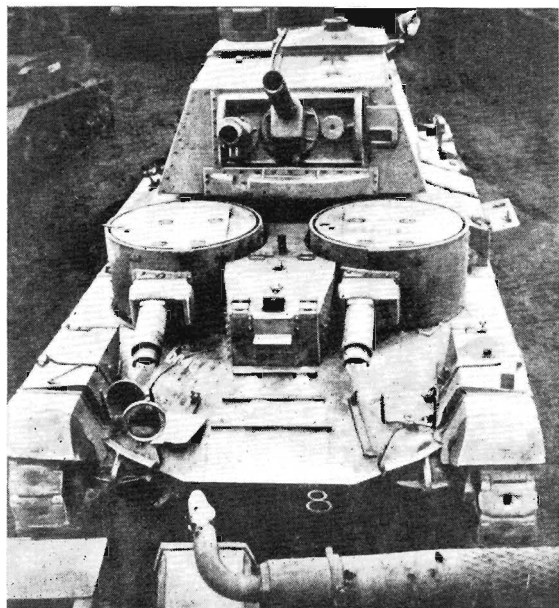
An A.9 coming ashore from a landing craft during an exercise in the Middle East. (Imp. War Mus.)

Vickers—the Carden who had developed the highly successful Carden Loyd tankettes and carriers from their beginnings in V. G. Loyd's London garage that he once managed. It followed the same general layout as the A.6, although smaller, with a centrally-placed fighting compartment and turret, two smaller machine-gun turrets at the front, either side of the driver, and the engine at the rear. The suspension was not covered by armoured skirting plates, unlike the earlier mediums, and consisted of two units of three road wheels each side, with rear drive sprockets and front idler wheels.

The medium tanks in service with the Royal Tank Corps were used equally for infantry close support and for mobile operations, but War Office policy was then changing to the concept of two separate classes of

tank, for what were regarded as two distinct kinds of warfare each of which, it was felt, demanded special characteristics in tanks. Carden was accordingly asked in addition to design—to the A.10 specification—an infantry tank using the same chassis as the A.9 but with additional armour up to a 1 in. (25.4 mm.) standard, compared with A.9's 14 mm. basis; a speed of as low as 10 m.p.h. was considered acceptable as the price for the extra load of some 3 tons.

Front view of a Cruiser Mark I CS of 2nd Royal Tanks in 1940. This clearly shows the short barrel of the 3.7 in. howitzer used in early close support tanks. (Imp. War Mus.)



An A.9 in the Royal Armoured Corps Tank Museum at Bovington, Dorset. Next to it is a Cruiser Mk. IIA CS. (B. T. White.)

Tank, Experimental, A.10E1—prototype of the Cruiser Mark II. (Imp. War Mus.)





Cruiser Mark I CS (left) and two Cruiser Mark IIAs on patrol in the Western Desert in 1940. This picture brings out the chief external differences between the A.9 and the A.10, including the engine air louvres. (Imp. War Mus.)

THE A.9 AND A.10

Work on both tanks started within a few months of each other in 1934; the A.9 prototype A.9E1 was completed in April 1936 and the A.10E1 appeared shortly afterwards. The A.9 was originally fitted with a 15 pdr. mortar (with co-axial .303 in. Vickers machine-gun) in the turret. This was, in fact, a low velocity close support weapon, but the alternative of a 3 pdr. was provided for in the design.

Unhappily Sir John Carden was killed in an air crash in December 1935 and so did not live to see the trials of his tanks. The A.9 performed well and could do a maximum speed of 25 m.p.h., but the suspension needed improvement, for the tank pitched badly on uneven ground, giving its crew an uncomfortable ride, and had a tendency to shed its tracks. Without Carden's guiding hand, development work took longer and it was not until the latter half of 1937 that the A.9

was considered satisfactory enough for the first production order—for 50 tanks—to be given. It was then officially designated Tank, Cruiser, Mk. I.

The infantry tank version, A.10, was by 1937 considered not heavily enough armoured for infantry support and was dropped. The following year it was, however, decided to produce it as a "heavy cruiser" and 75 were ordered initially.

The prototype built to the A.9 specification and known as Tank, Experimental Medium, A9E1, was originally fitted with a Rolls-Royce Phantom II engine, but this was later replaced with an A.E.C. 6-cylinder 8.85 litre engine—a diesel converted for use with petrol. This in turn was replaced by a 9.64 litre engine, developing 150 b.h.p.

The production series, known as Tanks, Cruiser Mk. I (and later as Tanks, Cruiser A.9 Mk. I: finally reverting to the original title) also used the 150 b.h.p. A.E.C. petrol engine. One hundred and twenty-five of

An A.10 with 2 pdr. gun and coaxial Vickers machine-gun in the turret. On the right is an A.13, a Cruiser Mark III. (Imp. War Mus.)





Two Cruiser Mark IIAs followed by a Valentine. The similarities and the differences between the two types are apparent in this view. In the rear are two Matildas, Infantry Tank Mk. II. (Imp. War Mus.)

these tanks were built (50 by Vickers and 75 by Harland & Wolff, Belfast) of which a proportion were close support tanks (designated Mk. I CS) equipped with 3.7 in. howitzers in the turret instead of 2 pdr. guns. The turret, incidentally, was the first in a British tank to have powered traverse. All tanks were armed with three Vickers .303 in. machine-guns, one co-axial with the main weapon in the turret and two in auxiliary turrets either side of the driver's cab. These auxiliary turrets were very small (even smaller in the prototype) and cramped and difficult to evacuate quickly in an emergency. They were omitted in the A.10 and in the Valentine.

A.9s were used in action by 1st Armoured Division in France in 1940 and later in Libya. They were also in service with the 7th Armoured Division in the early Desert battles up to 1941 and with the 2nd Armoured Division in Libya and in Greece.

The A.10E1, prototype of the intended infantry tank which was accepted into service as Tank, Cruiser, Heavy Mk. I, closely resembled A.9E1 except that the auxiliary machine-gun turrets were omitted, the driver's cab standing clear of the front sloping glacis plate. The front hull design in A.10E1 was later amended, however, to include a machine-gun position to the right of the driver. The A.E.C. engine was the same as that of A.9E1, although the cooling louvres were rearranged, and nearly all the mechanical features were similar. The extra weight brought about by the increased armour thickness reduced the maximum speed however.

The Heavy Cruiser designation was dropped in 1938 and replaced by Tank, Cruiser, A.10 Mk. I—eventually this confusing nomenclature was straightened out when the A.10 became simply Tank, Cruiser, Mk. II.

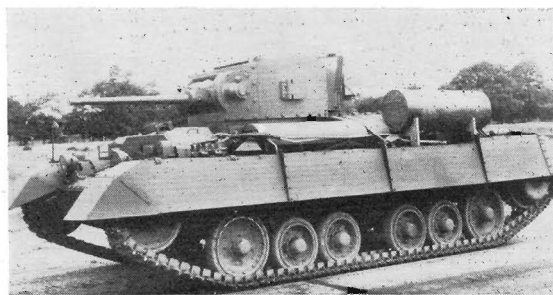
In the later production models, the co-axial machine-gun was a Besa—these tanks were designated Mk. IIA and were the first British tanks in which this weapon was introduced. There was also a Mk. IIA CS in which the turret 2 pdr. gun was replaced by a 3.7 in. howitzer which could fire smoke or high explosive ammunition.

Cruiser Mk IIs and IIAs were in action alongside A.9s in France in 1940 and in Libya in 1940–1941.

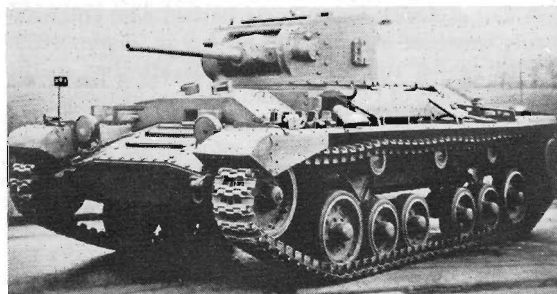
A.9s and A.10s could be used as pusher vehicles for the Anti-Mine Reconnaissance Caster Roller, a device originally designed in 1937 and intended to detonate by pressure contact anti-tank mines. It consisted of four rollers attached to a frame in front of the tanks so that two rollers, in tandem, were in front of each track. One version was designed by John Fowler & Co. (Leeds) Ltd., for the early cruiser tanks and another version, slightly modified, was intended for use with Valentine.

Cruiser Mark IIA CS (left) in the R.A.C. Tank Museum, Bovington, Dorset. The 3.7 in. howitzer of the close support tank can be compared with the 2 pdr. (40 mm.) gun of the A.9 alongside. (B. T. White.)





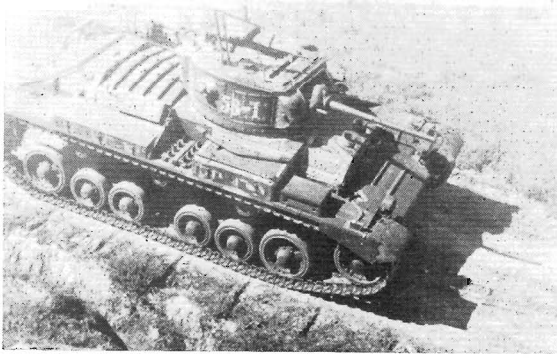
Left: Valentine I of 23rd Hussars, 11th Armoured Division, on an exercise in the United Kingdom in August 1941. Note the headlamps reversed to avoid damage. Right: Valentine II with track sandshields and auxiliary petrol tank. Note the revolver port on the side of the turret: this was not present in all tanks of this Mark. (Imp. War Mus.)



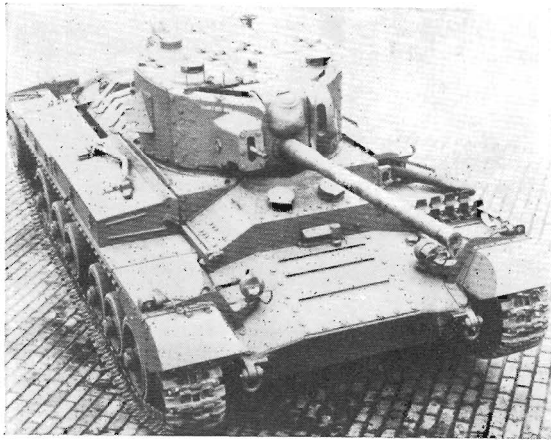
Left: Valentine IV. This Mark was externally identical to the AEC-engined Valentines I and II. (B. T. White.) Right: Valentine V in Tunisia, January 1943. Note the Bren gun with drum magazine mounted on the turret for anti-aircraft use. (Imp. War Mus.)

Valentine III of the New Zealand Tank Squadron on Nissan Island, Solomons group, during the Pacific campaign of 1945. This is one of the tanks in which the normal 2 pdr. gun had not been replaced by a 3 in. howitzer. (Sport & General.)





Left: A Canadian-built Valentine in the Soviet Union. This is a Mark VII with the cast nose plate. Note the Bren anti-aircraft mounting and the Soviet unit signs on the turret. (Sovfoto/R. J. Icks.) Right: This view of the Valentine XI shows well the coaxial 75 mm. and Besa mounting and also the cast nose of the hull, introduced in this Mark from the Canadian design. (Imp. War Mus.)



Valentine X—externally as Marks VIII and IX except for the modification to the turret face to accommodate the coaxial Besa machine-gun. The riveted front plates and 6 pdr. gun can be compared with the cast front plates and 75 mm. gun shown in the similar view of a Valentine XI. (Imp. War Mus.)

Valentine VIII—the Mark IX was externally identical and had the same turret armament of a 6 pdr. without a coaxial machine-gun. This tank is equipped with two 4 in. smoke dischargers mounted on the side of the turret. (Imp. War Mus.)

A carpet device for crossing barbed wire entanglements was tried out fitted to an A.9 in March 1939. The carpet—a roll of hessian—was attached to the tank by means of two arms and unrolled as the vehicle moved forwards. This experimental version was later developed for use by A.V.R.E.s for laying a path for vehicles over soft ground.

An A.9 was used in experiments at Christchurch, Hampshire, in connection with submerged running for water crossings. This was in 1940, shortly before the corresponding German experiments for Operation Sea-Lion—the hoped-for invasion of England. The system used on the Cruiser Mk. I was quite successful but War Office opinion was more in favour of floating devices. These culminated in the successful DD device, in the development of which the Valentines played an important part.

A.11—INFANTRY TANK MK. I

Before completion of A.9 and A.10 Carden had been asked to design another infantry tank, again on economical lines and using a commercial engine—this time a standard Ford V8 engine. This tank, the A.11, was intended to withstand any existing anti-tank





Valentine IIs of 48th Royal Tanks (21st Army Tank Brigade) on an exercise in Suffolk in June 1941. These tanks are fitted with the No. 11 wireless set, later superseded by the No. 19 set. The Brigade did not go into action with Valentines, but with Churchills (Infantry Tank Mk. IV), the first to do so—in Tunisia, 1943. (Imp. War Mus.)

weapons but was required to mount only a .303 in. Vickers machine-gun or alternatively the Vickers .5 in.—a light anti-tank weapon.

Trials of the A.11 (known at the time as a “heavy infantry tank” in comparison with the A.10) went well and it put up the unspectacular performance required of it. Only a limited order for 60 was placed, though, as it was then thought desirable to concentrate on a larger infantry tank with at least the same protection but armed with a 2 pdr. gun and able to tackle enemy heavy tanks. The production order for A.11 was later extended to a total of 139 (excluding A.11E1, the prototype) and in action in 1940, despite the tactical limitations imposed by their two-man crews and low speed, their armour was found to come up to expecta-



A line up of Valentines (Marks I or II) of the Polish forces in Scotland in August 1941. These tanks all bear W.D. numbers in a special series allocated to the Polish forces serving with the British Army. This, the 1st Polish Armoured Division, fought in 1st Canadian Army, 21 Army Group, in North-West Europe. (Imp. War Mus.)

tions and gave protection against most projectiles encountered.

VALENTINE PRODUCTION

Vickers-Armstrong’s proposal for a new infantry tank in 1938 was based on elements of the three earlier Vickers types A.9, A.10 and A.11 from which a great deal of experience had already been gained. The main points were that it should have armour protection on a 60 mm. basis, as good as that of the A.11, but mount a 2 pdr. gun in a two-man turret and still have a relatively low silhouette and be as light as possible. It was intended to use as far as possible components—such as

Valentine II on a realistic battle exercise in the United Kingdom in August 1941. This tank is fitted with a No. 19 set. (Imp. War Mus.)



the engine, transmission and suspension—which had already been proved in the A.9 and A.10.

The scheme was at first turned down by the War Office, but in July 1939 the first contract for Valentine tanks was placed, with the delivery of the first completed vehicles to commence in May 1940. When World War II broke out in September 1939, Vickers-Armstrong were instructed to give absolute priority to production of the “Tank, Infantry, Mk. III”, and concentrate their unrivalled experience in the design and manufacture of tanks on the Valentine.

The production of Valentine tanks was in the hands of three main contractors in the United Kingdom: Vickers-Armstrong Ltd. themselves, at their Elswick premises (near Newcastle—formerly the works of Sir W. G. Armstrong, Whitworth & Co. Ltd.); the Metropolitan-Cammell Carriage & Wagon Co. Ltd., an associated company of Vickers, at their Old Park Works, Wednesbury, Staffs., and later also at their Midland works; and the Birmingham Railway Carriage & Wagon Co. Ltd.

The other two firms, as well as Vickers, had experience in tank manufacture before the Valentine, both having been awarded small contracts for the production of A.10s which were nearing completion as the Valentine programme got under way.

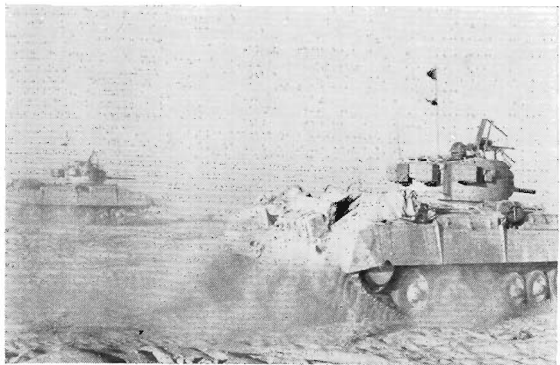
The first Vickers-built Valentine to come off the production line was completed, on schedule, in May 1940, and ten tanks were runners by the following month. The first Valentine assembled by Metro-Cammell was delivered at the end of July 1940; and by the Birmingham Railway Carriage & Wagon Co. at about the same time.

Output of Valentines from Vickers, the parent firm, went up from the ten delivered by June 1940, to 45 per month a year later, rising through 1942 to 20 per week in 1943. At the end of that year production was eased off and closed in early 1945 when a grand total of 6,855 Valentines (including some special vehicles on the Valentine chassis) had been built in the United Kingdom. Of this output, 2,515 tanks were built by Vickers-Armstrong themselves and 2,135 by Metro-Cammell.

In addition, an order was placed in Canada in the spring of 1940 for Valentines to be produced by the Canadian Pacific Railway at their Angus Shops, Montreal, locomotive repair works. The production prototype was completed in June 1941, and full



Valentines of Headquarters 29th Armoured Brigade (11th Armoured Division) in Rottingdean, Sussex, in June 1942. (Imp. War Mus.)



Valentines in the Western Desert in July 1942. Note the Bren guns on anti-aircraft mountings. (Imp. War Mus.)

production was under way in the late autumn of the same year. Subsequent contracts brought the total order up to 1,420 tanks; delivery reached 80 tanks per month—comparing very well with that in the United Kingdom—and the last tank was completed in mid-1943.

The grand total of 8,275 Valentines manufactured in the United Kingdom and Canada was far greater than that of any other British tank, and the home output alone exceeded that of the Churchill, the runner-up.

THE VALENTINE DESCRIBED

The hull of the Valentine was of fairly straightforward construction. The vertical sides were made in two

Left: A Valentine carrying infantry of the Black Watch and towing a 6 pdr. anti-tank gun, Tunisia, April 1943. Right: Valentine of 23rd Armoured Brigade entering Tripoli on January 26, 1943 carrying infantry and a piper of the Gordon Highlanders. (Imp. War Mus.)





A gap in a Desert minefield marked by tapes, with a Valentine passing through, August 1942. (Imp. War Mus.)

halves, the plates riveted together at a lap joint about the middle. The top plates were screwed into the top edges of the side plates, and the hull bottom plates, forming a channel deeper in the middle, were screwed into the under edges of the side plates. In later production tanks riveting was used instead for attachment of the top and bottom plates. The vertical nose plate and the vertical rear plate were riveted to angle iron stiffeners. There were three cross members in the hull: the vertical plate in front of the driver and incorporating the driver's direct vision port; an internal bulkhead immediately behind the driver; and another bulkhead separating the engine compartment from the fighting compartment.

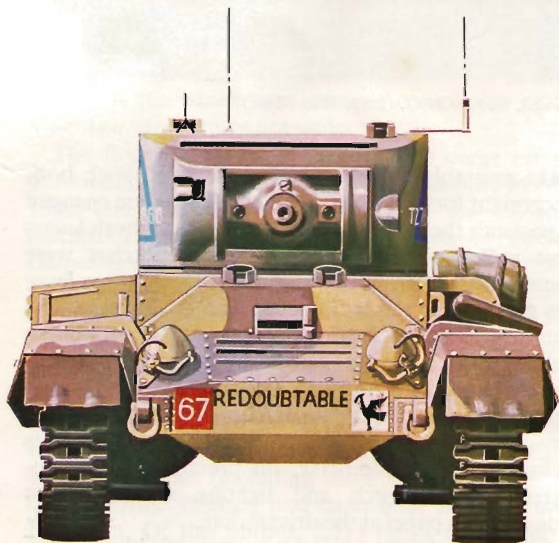
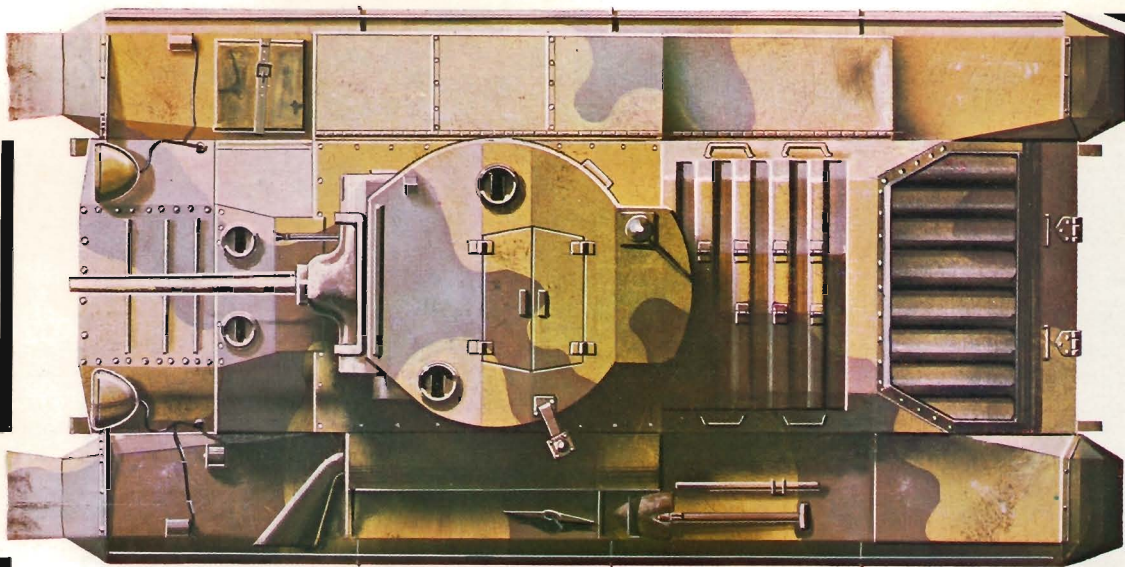
The driver's compartment housed only the driver, sitting centrally, and the driving controls. Steering, of the skid type operated by clutches and brakes, was controlled by means of two levers—one for each track. Each of these two levers was linked by two rods running the full length of the vehicle to the clutch and

brake assembly at the rear of the vehicle. With both levers right forward the steering clutches were engaged to transmit the drive through the tracks; if both levers were pulled right back the steering clutches were disengaged and the brakes applied. If only one lever was pulled back the tank would turn to that side. The clutch pedal was by the driver's left foot; the foot brake pedal and the accelerator pedal by the right. The gear change lever, with an open gate, was at the driver's right hand and a directional compass was mounted between his knees. The main driving instruments including the speedometer, oil pressure gauge, ammeter, starter switch and lighting switches were grouped on a panel at the driver's left.

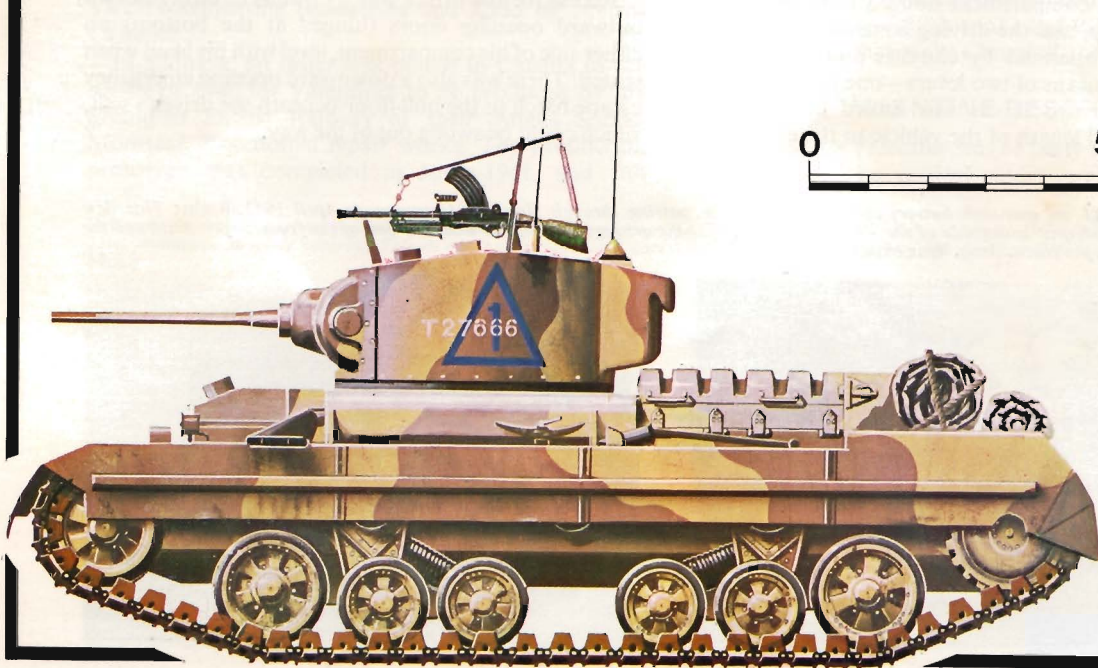
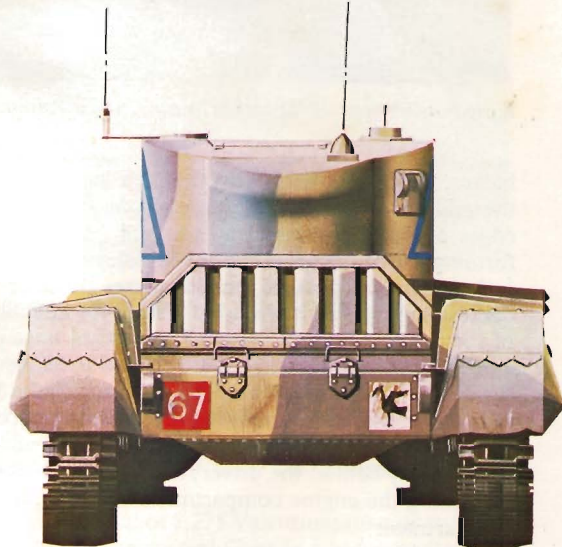
Access for the driver was by means of either of two outward opening doors (hinged at the bottom) on either side of his compartment, level with his head when seated. There was also a downward opening emergency escape hatch in the hull floor beneath the driver's seat, which could be swung out of the way.

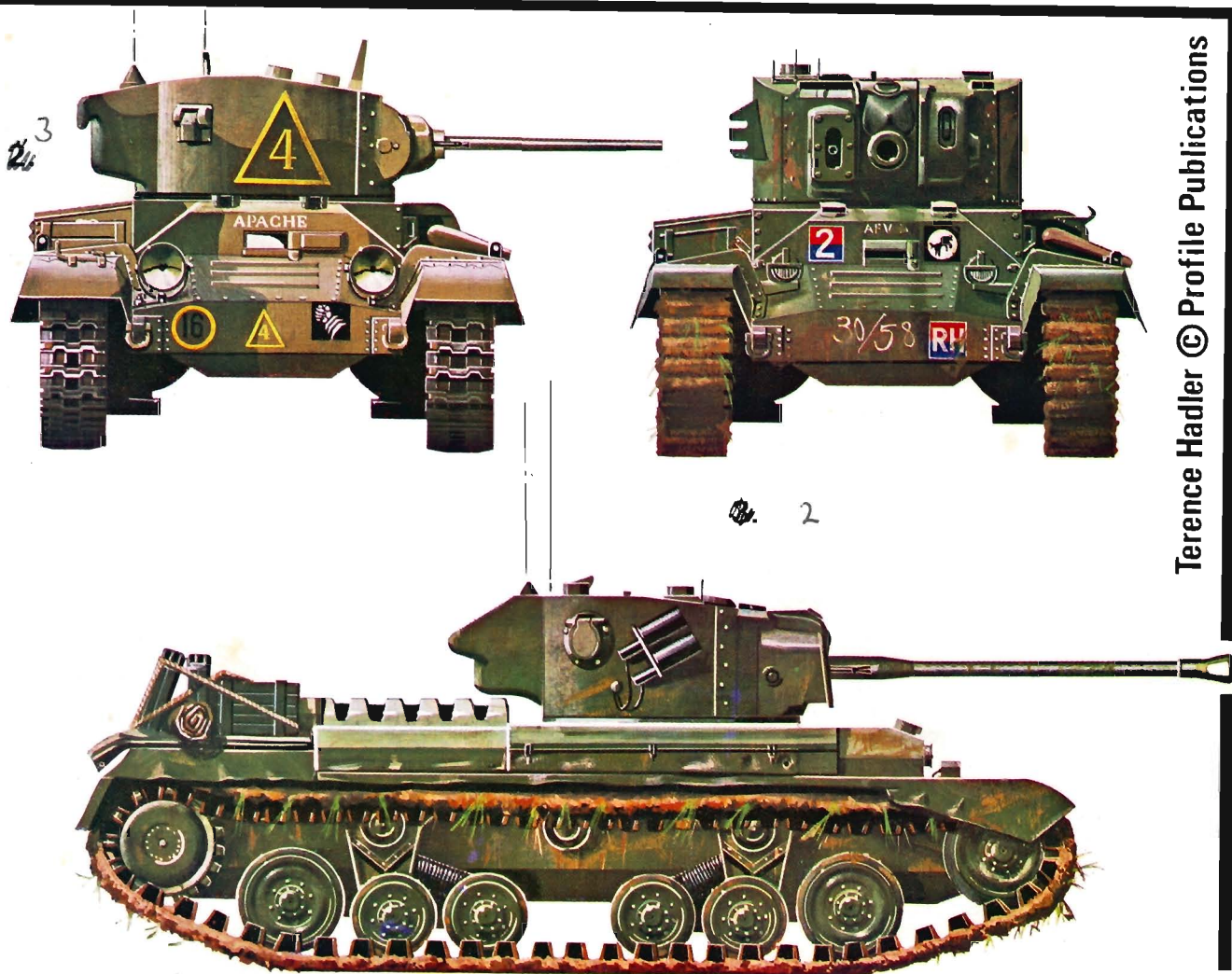
Left: Valentine XI, an anti-tank battery commander's vehicle, passing through Hopsten, Germany, in April 1945. Right: This view shows well the V-shaped under side of the Valentine's hull; also the arrangement of the inside of one of the front bogey units and the early type of twin-pin track. (Imp. War Mus.)





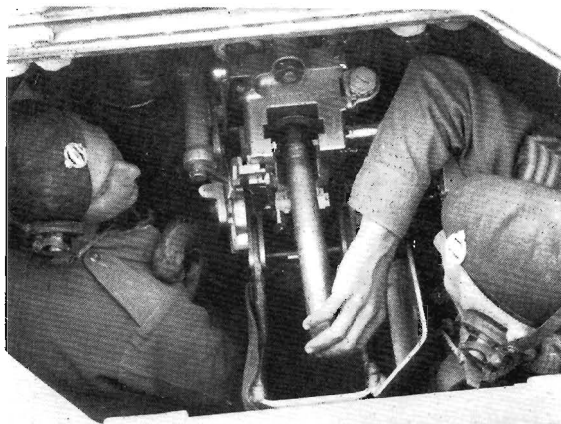
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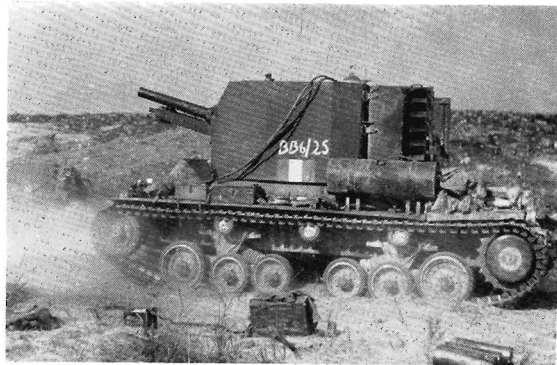


- 1 Valentine II of No. 1 Troop "A" Squadron, 50th Royal Tank Regiment in 23rd Armoured Brigade. This was as the tank appeared at the time of the Mareth battle in Tunisia in March 1943, near the end of the North African campaign. The original 8th Army yellow desert camouflage has been modified for the Tunisian landscape
- 2 Valentine XI used as a command vehicle in a Corps Anti-Tank Regiment, Royal Artillery. North-West Europe 1944–45
- 3 Valentine I of "A" Squadron 17/21st Lancers, 6th Armoured Division, October 1941
- 4 6th Armoured Division sign
- 5 RA unit sign with serial number
- 6 Formation sign (30 Corps)





Looking down through the turret hatch on to the breech of the 25 pdr. gun. The elevating shoulder piece for the gunner can be seen on the left. The loader on the right is placing a 25 pdr. shell in the breech. (Imp. War Mus.)



Carrier, Valentine, 25 pdr. Gun Mark I—a Bishop—in action in Sicily, 1943. (Imp. War Mus.)

cruiser tanks was also tried out. All types of Valentine track had twin horns, however, forming a path in which the road wheels ran.

THE VALENTINE MARKS

Eleven different marks of Valentine were built, together with sub-variants and versions for special tasks.

The original model, Tank, Infantry, Mk. III, known officially as Valentine I after June 1941, had an A.E.C. petrol engine like its predecessor A.10; and a two-man turret mounting a 2 pdr. gun and co-axial Besa

Rear view of a Bishop. Note towing hook, used for towing 25 pdr. field artillery limber. (Imp. War Mus.)



The fighting compartment with the turret mounted on the roof carried the other two members of the crew—the gunner at the left and the commander/loader at the right (in the three-man turrets of Valentine III and V the commander sat in the rear of the turret). The turret, constructed of front and rear castings riveted to rolled side plates, was mounted on a ball race, the lower half of which incorporated a fixed traversing rack. Traverse was by means of a pinion operating on this rack through a reduction gear to a hand wheel for use in emergency and, for normal use, by electrical power. Control was through a spade grip and trigger in a control box: the further left or right the grip was twisted the further the turret rotated in that direction. Elevation of the turret guns was by a shoulder piece, without gearing except in the case of the 75 mm. gun of Valentine XI. The wireless was carried inside the rear of the turret—in early tanks a No. 11 set, with Tannoy equipment for crew intercommunication. Later the No. 19 wireless set which incorporated internal communications together with long range and short range networks was used.

In the rear of the hull, behind the rear bulkhead of the fighting compartment, was situated the engine, gearbox and transmission; the gearbox and bevel drive being assembled in one unit with the engine. The power was transmitted to the driving sprockets through multiplate steering clutches and a compound epicyclic reduction gear mounted on the hull side plates. The steering brakes were incorporated on the outside of the reduction gears in the drums which were a distinctive feature of the Valentine.

The suspension consisted of two groups of three road wheels each side. Each group contained two 19½ in. diameter wheels and one of 24 in. diameter mounted on a primary and a secondary fork, sprung by means of a large spring incorporating a hydraulic shock absorber. The idler wheels were at the front and the drive sprockets at the rear; three rollers were mounted each side to carry the top run of the track.

Early tanks had a twin pin type of track with 73 shoes, but later models had a shorter pitch single pin type which was standardised and consisted of 103 shoes. In a few early models a short pitch track with shoe profile like that of the Covenanter and Crusader



Self-propelled 6 pdr. mounting on Valentine I—experimental only. (RAC Tank Mus.)

machine-gun. Valentine II (Tank, Infantry, Mk. III*) was identical except that an A.E.C. diesel engine was used. The first 1,025 tanks to be built were of these two marks.

The A.E.C. diesel engine which powered Valentine II and also two later marks was developed from the A.E.C. Comet engine used in commercial road vehicles. It was a six-cylinder unit of 120 mm. bore and 142 mm. stroke with push-rod operated overhead poppet type valves. The pistons were of B.H.B. aluminium alloy. A gear type oil pump and dry sump lubrication system was used. The engine, clutch and gearbox were bolted together in one unit, the gearbox being a Meadows sliding pinion model with five speeds forward and one reverse, direct drive being on 4th gear.

A two-man turret had the disadvantage that the tank commander had to be also the gunner or the wireless operator-cum-loader with consequent difficulties in commanding the tank in action. This problem was intensified for troop commanders, who had to give orders to two other tanks besides their own. The Valentine III was given a modified turret with room for three men, therefore, which although larger was much the same in external appearance as that of Mk. II. The turret ring was the same size but more internal space in the turret was created by altering and extending the front plate so that the gun mounting was further forward and at the same time enlarging the rearward bulge of the turret. The weight of the three-

Rear view of an Archer. Note how engine air louvres differ from those of the Valentine tanks. (Imp. War Mus.)



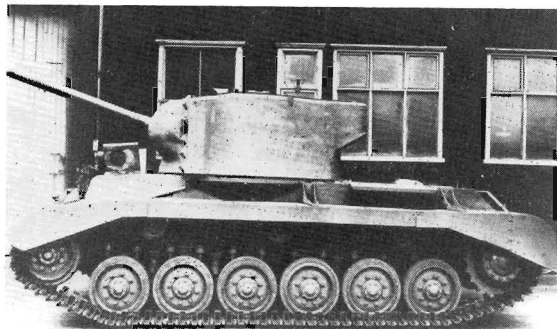
Front view of S.P. 17 pdr., Valentine—an Archer. Note spare track plates, the front towing hook and the cable bracket on the right-hand side of the hull. (Imp. War Mus.)

man turret increased to approximately 3½ tons, compared with the 2¾ tons of the earlier two-man type.

The Valentine III formed the basis of the only close support version of the Valentine to be built. Matilda or later close support tanks were usually used in conjunction with Valentines but there was a special need for a Valentine close support tank for use with the 3rd New Zealand Division in the S.W. Pacific campaign. Only one squadron of tanks was to be sent in 1944 to support this Division and Valentines were chosen as the most suitable tanks available in New Zealand to form the equipment of this unit. However, they had the disadvantage that the 2 pdr. gun could not provide effective close support with high explosive considered essential for these operations. There was a 2 pdr. H.E. shell but this lacked the punch of the 18 pdr. shell of the 3 in. howitzer used in British close support tanks. Accordingly a conversion was designed in New Zealand to accommodate 3 in. howitzers, to be taken from Matilda IV CS tanks, in Valentine IIIs. The changes to the normal Valentine in the conversion to the 3 in. howitzer version included re-alignment of the telescopic sight bracket, provision of equipment to permit indirect fire, and resetting of the ammunition racks to take 3 in. ammunition, of which 21 of H.E. and 14 of smoke shells could be accommodated.

Nine Valentine close support tanks formed the strength of the New Zealand Tank Squadron, together with 16 normal Valentines (for which some 2 pdr. H.E. ammunition, made in New Zealand, was provided) and were used successfully in the S.W. Pacific opera-

Tank, Infantry, Valiant (A.38). Side view, showing general similarity of layout to the Valentine. (Imp. War Mus.)





Valiant—front view. Note inverted-V top surface of cast nose plate. (Imp. War Mus.)

tions. Some of these tanks were still in use by the New Zealand Army up to 1955.

Valentine IV was similar in most respects to the earlier two-man turret models but introduced the General Motors diesel engine, used in all later Marks except one; and Valentine V was the three-man turret model using this engine.

The General Motors two-stroke diesel engine introduced in these two marks soon built up a good reputation for itself for its quiet running and high degree of reliability—two important qualities in any tank engine. The engine was bolted up in one unit with the clutch and Spicer synchromesh gearbox—this had five forward speeds and reverse. The six cylinders were 4.25 in. bore and 5 in. stroke, were fitted with overhead valves, and the pistons were a malleable iron, tinned. The lubrication system was of the dry sump pattern, forced feed with a gear type oil pump. Cooling was by means of two six-bladed 20 in. diameter fans which drew in air through the inlet louvres over the engine, blew it through the radiators (placed over the clutch and gearbox) and out through the outlet louvres. This engine, the General Motors Type 6-71, developed about 130 h.p. at 1,800 r.p.m.

The Canadian-built Valentines were designated Tanks, Infantry Mk. III*** at first and later as Valentines VI and VII. These were both two-man turret models, using the General Motors diesel engine.

The main armament was the 2 pdr. gun, but after the first 15 vehicles the co-axial Besa machine-gun was replaced by a .30 in. Browning. In the Mk. VII a remote control grip and firing gear attachment was added to the Browning machine-gun, and the No. 19 wireless set replaced the No. 11 set. A sub-variant, Valentine VIIA, had a number of improvements, including an auxiliary fuel tank, an oil cooler, studded tracks, rear batteries, a convoy lamp and turret protection angles. To suit the Valentine to production in Canada, U.K. standards used in the drawings had to be converted to equivalents used in North America, but some more fundamental changes in the design, which made for simpler and better production, were introduced by the Canadians during the course of manufacture. These included a cast turret and cast engine armoured louvres to replace the fabricated types, and cast nose armour, replacing the built-up structure used in the original design. The cast nose was later adopted for British built Valentines.

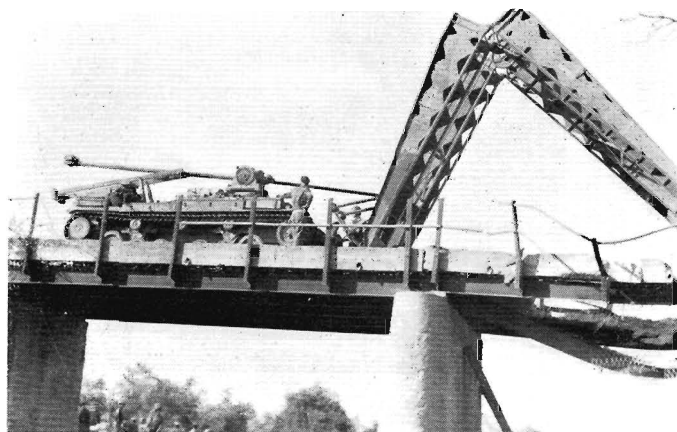
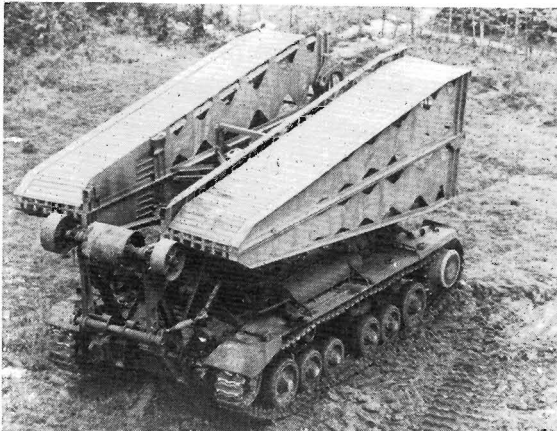
The next British mark of Valentine, the Mk. VIII, had the A.E.C. diesel engine and a redesigned two-man turret mounting a 6 pdr. gun only, and the Valentine IX was the same vehicle but with the General Motors diesel engine. In some tanks of Mk. IX and subsequent marks an uprated 165 b.h.p. unit was used instead of the earlier 130 b.h.p. engine.

Although the 6 pdr. mounting used in the Valentine VIII and IX was designed at a time when it was urgently necessary to get a supply of 6 pdr.-armed tanks in the field without upsetting the existing production programme, the absence of a co-axial Besa machine-gun was a serious fault. This was rectified in Valentine X by a further redesign of the turret. The engine was again the General Motors diesel—the 165 b.h.p. model.

The final version, Valentine XI, was fitted with a 75 mm. gun and co-axial Besa machine-gun in a two-man turret, and was powered by the General Motors 165 b.h.p. diesel engine. It was during the course of production of this mark that the cast nose developed by the Canadians was introduced in the British-built tanks.

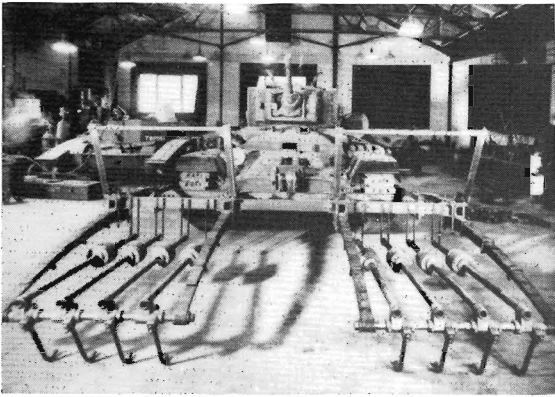
Throughout this progressive development over a period of 3½ years of quantity production the Valentine remained largely unchanged in external appearance

Left: Valentine Bridgelayer—front three-quarter view with bridge folded. The rollers which take the weight of the bridge when it is being laid are at the front, above the driver's head. Right: Valentine Bridgelayer laying its bridge over a gap in a bridge in Burma. (Imp. War Mus.)





Valentine with Anti-Mine Roller Attachment Mk. 1B. The equipment has been damaged in exploding a mine. (Imp. War Mus.)



Valentine III or V with anti-mine "rake". (B. T. White.)

and retained its compact shape and low silhouette. Even when armed with the 75 mm. gun it was only about a ton heavier than the first tanks and its performance was virtually unaffected.

VALENTINE SPECIALS AND S.P.s

The Valentine chassis was also adapted for a number of special armoured vehicles and self-propelled mountings. Of the specialised armour the Valentine Bridgelayer was operationally the most important: these were issued on an establishment of six per armoured brigade equipped with cruiser or medium tanks and were used in action in Italy, North-West

Europe and in Burma. The "scissors" bridge was carried folded and was raised and placed in position, opened out, by means of a screw jack. The bridge could span 30 feet and take tanks up to 30 tons in weight.

A lightweight ramp tank known as Burmark using the Valentine chassis was designed for the Far East theatre. This was turretless and had decking built over the hull and hinged ramps at front and rear. It was not used in action or further developed because of the War's end.

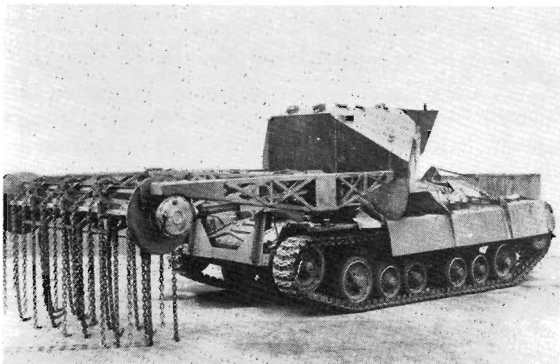
The first production DD amphibious tanks were adaptations of the Valentine—Mks. V, IX and XI. The DD device, which was invented by Nicholas Straussler, was a means of increasing the freeboard of a tank to the point where it would float. Coupled with this was a means of transmitting power from the tank's main engine to a screw at the rear to propel the vehicle in water. The extra freeboard was achieved by the use of a collapsible canvas screen attached all round the hull, which was waterproofed, at the level of the track guards. The screens were raised by inflating rubber tubes by means of compressed air bottles. The screens could quickly be lowered by deflating the tubes as the tank came out of the water, allowing free use of the turret armament immediately.

Straussler's invention was first tried out on a 7-ton Tetrarch light tank and, when proved and accepted by the War Office, the design was adapted to the Valentine tank. Essentially the same pattern was used but a higher freeboard was needed to deal with the Valentine's weight, which was over twice that of the Tetrarch. The conversion of a total of 625 Valentine DD tanks was undertaken by the Metropolitan-Cammell Carriage & Wagon Co. Ltd., delivery first beginning in March 1943, and ending in 1944.

Valentine DD tanks were used widely for training in the United Kingdom and also in Italy and India, although their only operational use was in small numbers in Italy in 1945.

Tank flamethrower experiments in the United Kingdom were first conducted using Valentine tanks as the basis. Two different designs, one by A.E.C. Ltd. and the Petroleum Warfare Department and the other by the Ministry of Supply flamethrowing research section, both employed Valentine tanks with trailers containing the flame fuel. The Ministry of Supply vehicle had a cordite operated flame gun and the A.E.C. design used compressed hydrogen to project

Left: Valentine Scorpion flail tank. Right: Valentine Scorpion towing a Centipede for dealing with anti-personnel mines. (Imp. War Mus.)



the burning fuel. The latter design was chosen for further development in 1942 and formed the basis of the Churchill Crocodile flamethrower. A different form of flamethrower—a 9.75 in. mortar firing a combustible projectile—was also tried out experimentally on a turretless Valentine.

Various mineclearing devices were built on Valentines or designed as attachments, including the Anti-Mine Reconnaissance Caster Roller Mk. IB, a device with spiked rollers used in the Middle East, and Snake. The latter was a long tube of explosive pushed by the tank across a minefield and then exploded by remote control. A curious mineclearing “rake” with weighted tines, believed to have been designed by Nicholas Straussler, was also tried out experimentally on a Valentine. Probably the most important anti-mine device on the Valentine was the “U.K. Scorpion Mk. III”. Although not used operationally, 150 of these flail tanks were built and in 1943-1944 used to train the flail regiments which later went into action with Sherman Crabs. Valentine II or III chassis were employed, with turrets removed and replaced by a fixed armoured box containing two Ford V-8 engines for the flail drive, which was transmitted via cardan shafts to the rotors carrying the beating chains. This armoured structure also accommodated the tank commander and the flail equipment operator, the driver’s position being unchanged. The Valentine Scorpion was quite effective but was replaced by the more powerful Sherman which also had the advantage of retaining its main armament.

Three self-propelled mountings were based on the Valentine. The first, a S.P. 6 pdr. mounted behind a shield in the fighting compartment of a turretless tank, was not developed because the Valentines VIII and later models had the same weapon in a turret.

Carrier, Valentine, 25 pdr. gun, Mk. I—known as Bishop—was produced urgently in 1942. The Valentine II chassis was used and 100 were built: they saw action in the Western Desert, Tunisia and in Sicily. The 25 pdr. was mounted in a simple armoured box structure with its ammunition carried in a towed limber.

S.P. 17 pdr., Valentine, usually called Archer, was developed from 1943, when the pilot vehicle was completed, and eventually succeeded the Valentine itself in production. Archer consisted of a 17 pdr. gun mounted facing rearwards in an open top armoured hull. The lower part of the hull was basically the same as the tank, however—the suspension was identical and so was the transmission, although the higher rated General Motors 6-71M, 192 b.h.p. diesel engine produced the higher speed of 20 m.p.h. Six hundred and sixty-five Archers were built and some were used in Italy in 1945 and others in the North-West Europe campaign. They remained in service with the British Army for some years after the War.

Miscellaneous vehicles based on the Valentine were the Valentine Dozer, an O.P. tank (carrying artillery observation and signals equipment and a dummy gun) and the Gap Jumping Tank. This last, designed at the end of World War II, could be propelled by rockets over minefields or other obstacles. The crewless Valentine performed in a highly spectacular way, but was eventually abandoned because it persisted in landing the wrong way up!



Valentine with a 9.75 in. mortar mounted in the fighting compartment. This mortar fired a combustible projectile. Experimental vehicle only. (Imp. War Mus.)



Valentine with cordite-operated flamethrower—experimental vehicle built by the Ministry of Supply. (Imp. War Mus.)



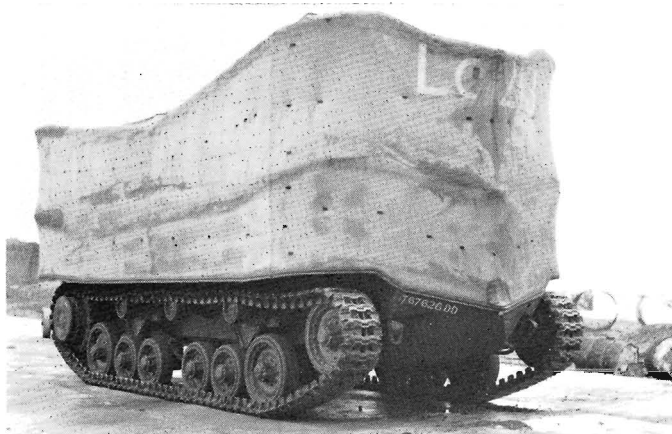
Valentine with gas pressure system flamethrower. This experimental vehicle, built by A.E.C. Ltd. in conjunction with the Petroleum Warfare Department, formed the basis of the later Crocodile flamethrower system. (Imp. War Mus.)

THE VALIANT

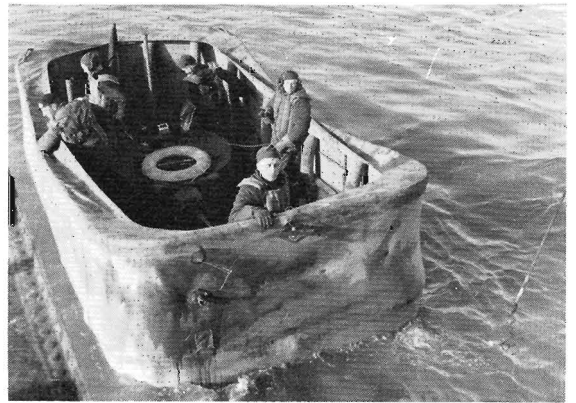
The final outgrowth of the Valentine was the 27-ton Valiant Infantry Tank which resembled its predecessor in several respects although it was, in fact, a new design. Design for the tank to specification A.38 was originally undertaken by Vickers-Armstrong, then was taken over by the Birmingham Railway Carriage



Valentine IX DD tank with the flotation screen folded. (Imp. War Mus.)



Valentine DD with flotation screen erected. (Imp. War Mus.)



Valentine V DD entering the sea from the bows of a tank landing craft. (Imp. War Mus.)

& Wagon Co. Ltd. (another firm in the Valentine production group). Finally, however, the design parentage was transferred to Ruston & Hornsby Ltd., of Lincoln, who built the pilot models in 1943–1944.

In the Valiant the cast nose plate of the Valentine was adopted although it had an inverted-V top surface and was much thicker, up to $4\frac{1}{2}$ in. The front plate of the turret was also a casting. The turret armament was either a 6 pdr. gun or a 75 mm., together with a coaxial Besa m-g. This was much like the later Valentines, although the turret held three men. The suspension consisted of six road wheels and three rollers each side—again like the Valentine. The Valiant's road wheels were all the same size and were similar in appearance to the Valentine's 24 in. diameter wheels. However, they were all independently sprung on wishbone arms, with coil springs.

The engine of the Valiant also followed precedent set by the later Valentines in that it was a General Motors diesel, although more powerful—210 b.h.p. A.E.C. engines were proposed as an alternative, and in a second version, Valiant II, either Ford V-8 or Rolls-Royce Meteorite engines were to be tried.

Rolls-Royce Ltd. joined Ruston & Hornsby as joint design parents for the Valiant II in order to further the development in this tank of the Meteorite engine which was derived from the Meteor, a de-rated Rolls-Royce Merlin aero-engine. The Meteorite 8-cylinder engine was designed for petrol or diesel fuel and foreshadowed the post-war multi-fuel tank engines.

The Valiant had several merits—it was compact and well armoured for its size and used some existing components, but the steering was found on trials to be unsatisfactory and the rear overhang caused problems with weight distribution. Also, the ground clearance of $9\frac{1}{2}$ in. was regarded as inadequate. These faults could no doubt have been corrected, but by 1944 it was felt that there was no longer a requirement for this particular type of tank.

VALENTINE IN SERVICE

The Valentine was intended as an infantry tank and was accepted into service as such, most of the first production vehicles being issued to Army tank

brigades. However, production of cruiser tanks was insufficient to meet the needs of the new armoured divisions raised in 1940–1941 and so Valentines, which were coming off the production lines in good numbers by mid-1941, were issued in lieu of cruiser tanks to many armoured regiments in the United Kingdom. By October 1941, the 6th, 8th and 11th Armoured Divisions (each with two armoured brigades at that time) had some 900 Valentines between them, although the 11th was not fully up to strength and in the following year was re-equipped with cruiser tanks. Both the 6th and 8th Armoured Divisions took Valentines into action with them—the former in Tunisia at the end of 1942. The 23rd Armoured Brigade from the 8th Armoured Division joined the Eighth Army in July 1942 and was employed as an Army tank brigade in support of the New Zealand Division and the 9th Australian Division at the first battle of Alamein. The Brigade suffered heavy losses in this its first battle but helped to restore the faith of the infantry in tanks. The 8th Armoured Division, re-organised on the new establishment with only one armoured brigade, the 24th, arrived in Egypt in August 1942, equipped with Valentines, although these were not long afterwards replaced by Sherman tanks. Besides these formations some other units in the Middle East were also equipped with Valentines in part or completely, from around February 1942 onwards.

The organisation of tanks in both Army tank battalions and in armoured regiments was basically the same—three fighting squadrons, each squadron consisting of five troops of three tanks each. The armoured

regiments of the 6th Armoured Division at the time of its arrival in Tunisia in most cases had two of the Valentine troops in each squadron replaced by 6 pdr. equipped Crusader cruiser tanks.

The specification of the Valentine made it acceptable as a cruiser tank and as such it had better protection than any British cruiser before the Cavalier–Centaur–Cromwell series, and also most contemporary German tanks, although the speed was lower than was considered desirable, even if it was better than that of the A.10, the Cruiser Mk. II. The lack of range of the 2 pdr. gun and also the absence of effective high explosive ammunition was a disadvantage shared by most British tanks up until 1942, when 6 pdr.-equipped tanks started coming on to the battlefields—some 6 pdr. Valentines were employed in North Africa towards the end of the campaign. The official concept of different specialised roles for “I” tank and cruiser sometimes inhibited the employment of the Valentine in “cavalry” roles which it could have undertaken quite effectively.

The main tactical drawback of the Valentine was that (with the exception of Mk. III and V) it was a three-man tank with the disadvantage that in battle the tank commander had to take on the role of gunner or wireless operator-cum-loader. The Valentine was also a fatiguing tank to drive, through the combination of a somewhat uncomfortable driving position and the effort required to operate the steering levers.

On the credit side, development of the Valentine had eliminated the less trustworthy features at an early stage. The amazing mileages put up by Valentines of the 23rd Armoured Brigade in 1942–1943 speak for

Valentine I with narrow tracks with a tread pattern like those of the Cruiser Mark III, IV, V and VI series. It was, however, of the twin guide horn type like other Valentines. The heavy armoured louvres on the rear deck show up well in this rear view. The formation sign on the left is of forces in Northern Ireland. (Imp. War Mus.)





The Rock of Gibraltar with a Valentine II of the Gibraltar Tank Squadron, November 1942. (Imp. War Mus.)

themselves and its mechanical reliability, particularly at a period when this was not a noteworthy feature of several British tanks, offset the Valentine's disadvantages from the point of view of its crews by whom it was generally well liked.

The most significant fact about the Valentine is, however, that it was a battleworthy tank coming off the production lines in quantity when it was most needed—firstly to help re-equip the British armoured units after Dunkirk in 1940 and then the new formations raised in 1940 and 1941. It is not surprising that the Valentine should have become the most widely distributed British tank of World War II. The North African theatre in 1942–1943 was its most important battle area, and Valentines were in their greatest numbers in the United Kingdom in units engaged in training and in Home Defence.

A large number of Valentines was sent to the U.S.S.R. in 1941–1943. These were tanks of nearly all marks except Mk. I, and included the whole Canadian production, except for the first 30 vehicles, which were retained in Canada for training purposes. Some 1,300 British-built Valentines were also despatched and getting on for 400 (British and Canadian production) were sunk by the enemy *en route*. The Russians made good use of their Valentines—some were sent into action only 40 minutes after arrival at the railhead for the battlefield.

The early Valentines' tracks gave some trouble in Soviet winter operations because at temperatures between zero and minus 20 degrees the snow packed in

them, although at temperatures colder than minus 20 degrees the snow powdered into a fine dust and blew away. Apart from the track troubles, which were eliminated later, and the 2 pdr. gun, which was felt to be too small, the Russians liked the Valentine very well. It was the sort of straightforward but effective design that was likely to appeal to Soviet tank crews. The Soviet Government Purchasing Commission in the U.S.A. wrote in August 1942, particularly asking for the number of Valentines shipped to the U.S.S.R. to be increased because "these tanks have given a fine performance in combat action."

The Valentine was used (in squadron strength) for the defence of the Rock of Gibraltar and also partly equipped some of the Special Service Tank Squadrons, one of which was engaged in an amphibious landing against heavy opposition in Madagascar in 1942. A New Zealand squadron of Valentine III's (some of which were converted to take 3-inch howitzers from Matilda close support tanks) was used in the Pacific campaign. Valentines were used for defence and training purposes in India, from where in 1943 was mounted a little known amphibious assault at Arakan in Burma, although the Valentine was not used in the full-scale campaign in 1944.

The Valentine, although by 1944 armed with the 75 mm. gun, had been rendered obsolete by the Sherman, then available in large quantities from the United States, and by later-designed British tanks. However, it was found still possible to give them a useful role as battery commanders' vehicles—retaining

full armament—in self-propelled 17 pdr. anti-tank regiments equipped with Archers, which were themselves developed from the Valentine, or M-10s. In this function the Valentine was in at the final stage of the War in Europe.

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A.F.V. Series Editor: DUNCAN CROW

SPECIFICATION:

TANK, INFANTRY, MARK III*—VALENTINE II

General

Crew: 3—driver, commander, gunner (the commander acted also as wireless operator-cum-loader or sometime took on the gunner's job, leaving another member of the crew as operator/loader).

Battle weight: 16 tons.

Power/weight ratio: 8.1 bhp/ton approx.

Bridge classification: 16.

Dimensions

Length overall and hull length: 17 ft. 9 in.

Height: 7 ft. 5½ in.

Width: 8 ft. 7½ in.

Track centres: 7 ft. 3 in.

Track width: 14 in.

Armament

Main: Ordnance Q.F. 2 pdr. Mk. IX or X and one Besa 7.92 mm. machine-gun mounted co-axially in turret.

Auxiliary: One Bren 0.303 in. machine-gun on collapsible mounting on turret roof. One 2 in. Smoke Discharger.

Fire control

Free elevation of main armament (by means of shoulder piece); traverse by electrical power with alternative manual operation. Guns fired by means of pistol grips.

Ammunition

2 pdr.: 60 rounds, stowed in fighting compartment.

Besa: 3,150 rounds.

Bren: 600 rounds.

2 in. smoke bombs: 18.

Sighting and Vision

Commander: Vickers tank periscope in turret roof.

Gunner: Vickers tank periscope in turret roof and Telescope, Sighting, No. 30, Mk. I or IA.

Driver: two Vickers tank periscopes on roof of compartment, and direct vision port.

Communications

Wireless Set No. 19 incorporating 'A' long range set and 'B' short range set, also intercomm. for all crew members. (Standard from February, 1943—earlier some tanks had the No. 11 Low Power set, with crew Tannoy equipment.)

Armour

Turret: castings, riveted and bolted, front 65 mm., sides 60 mm.

Hull: plates riveted and/or bolted. Nose plate 60 mm. at 21°. Glacis plate 30 mm. at 68°. Sides 60 mm. vertical.

Engine

A.E.C. Type A.190: diesel.

6 cylinders in line.

Capacity: 9.6 litres.

131 b.h.p. at 1,800 r.p.m.

Fuel: 36 gallons (31 gallons in main tank, 5 gallons in pressure tank—both in engine compartment on left side of engine).

Transmission

Meadows gearbox Type No. 22, sliding pinion, 5 speed and reverse.

Overall ratios: 1st 1.01-1.18:1, 2nd 4.8-5.28:1, 3rd 26-02:1, 4th 13-482:1, 5th 9-774:1, Reverse 142-914:1.

Drive to sprockets through multiplate steering clutches and compound epicyclic reduction gear mounted on hull side plates. Steering brakes incorporated on outside of reduction gears.

Suspension

Slow motion type: two groups of three rubber tyred wheels each side (each group one 24 in. wheel and two of 19½ in. diameter). Single spring in each group, damped by shock absorbers. Front idler wheels 24 in. diameter; drive sprockets at rear. Three track return rollers each side.

Tracks: single pin type, 103 shoes per set; pitch 4.36 in., width 14 in. (early twin pin track—73 shoes per set).

Electrical System

Service dynamo: C.A.V. Type G 5524B-3X.

Turret traverse dynamo: C.A.V. Type D.O. 7 L.X.-1.

Batteries: Four 6 volt.

Performance

Maximum road speed: 15 m.p.h.

Vertical obstacle: 3 ft. 0 in.

Trench: 7 ft. 9 in.

Wading: 3 ft. 0 in.

Range: 90 miles (road); 2½ miles per gallon.

Valentine V of 6th Armoured Division moving up near Bou Arada, Tunisia, in January 1943. It is towing a Rotatrailer containing spare fuel and ammunition. Note the spare track added to the nose plate for extra protection. (Imp. War Mus.)





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5	Light Tanks Marks I-VI	20	Sherman '75'
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7	Mediums Marks A-D	22	T-54, T-62
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