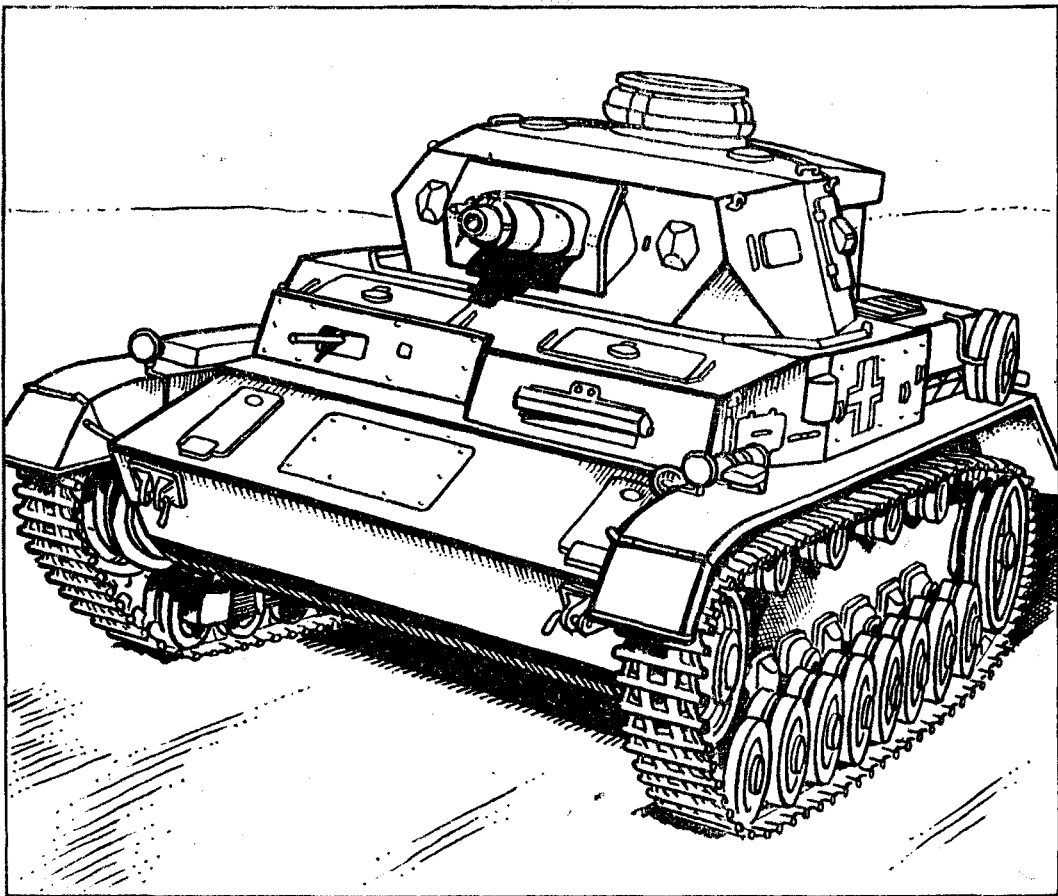


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Preliminary Report No.7.

Pz.Kw. IV



School of Tank Technology
Egham



November 1942

(S) Tanks

PRELIMINARY REPORT NO.7

Pz. Kw. IV

STT/8/2/6

Examined at Farnborough (D.T.D. Project No. V.7005) November 1942.
Examiners: Major J.D. Barnes, R.T.R., and Captain J.G. Holmes.R.E.M.E.

1. TYPE Pz.Kw.IV. Chassis No:
Year of Manufacture: Not known - engine and gearbox stamped 1940
Speedometer reading: 4465 Km (2790 miles).

2. IDENTIFICATION MARKINGS

Afrika Korps sign on each side and front of superstructure.
Usual German cross on front and rear of superstructure, on rear of turret and on stowage bin at rear of turret.
Camouflage by green marbling on putty coloured background.

3. GENERAL CONDITION

Vehicle is a non-runner. Near-side track damaged. Several hits have registered on hull and superstructure three of which have penetrated through rear of tank to engine and fighting compartments. (See para. 14).

4. WEIGHT

19.3 tons (Unladen).
Estimated fighting weight 22 tons.

5. SPEED

Maximum speed - Not tested. Painted inside superstructure in front of driver - Höchstgesche 25 Km (i.e. Maximum permitted speed 15½ m.p.h.).

6. CREW Five

7. DIMENSIONS

Length	19' 4"
Width	9' 7"
Height	8' 6"
Clearance	1' 2½"
Ground Contact	11' 6" (to centres of front and rear bogies)
Track Centres	7' 10⅞"

8. ARMAMENT

One 7.5 cm. short barrellled gun and one M.G. co-axial in turret mantlet and one M.G. in a ball mounting in the off-side front vertical plate.
Both M.G.'s are deficient.
The Breech of the 7.5 cm. gun is marked - 1940.Rh.294.R.855.
A mounting for telescope is on the left of the 7.5 cm. gun - the telescope is deficient.
The co-axial M.G. is fired by foot operated trigger.
The elevating gear of pinion and rack type is controlled by hand-wheel on left of gun and permits mantlet to be moved through 32° maximum depression 11° maximum elevation 21°. Fifteen turns of handwheel are required from maximum elevation to maximum depression.



9. AMMUNITION CARRIED

No definite indication can be given owing to damaged and deficient boxes - it would appear to be the same as in the vehicle examined by Messrs. Leylands, i.e. 7.5 cm - 105 rounds.

10. TURRET

Of welded construction. Internal diameter 5'1".-

The rear is a single curved rolled plate and the roof also a single

formed plate. This method of construction reduces the number of welded joints. To the right and forward in the turret roof is a circular opening protected by a circular guard plate beneath which is mounted an electrically driven extractor fan. (Fig. 1).

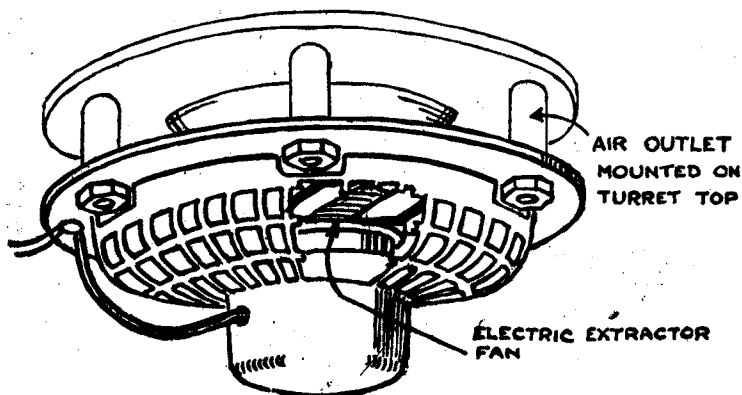


Fig. 1

On the left in the turret roof is a circular signal port of 5½" diameter, protected by B.P. cover.

Power and Hand Traverse Gear - 360° traverse by hand and power is provided and the floor of the turret rotates and is suspended from the turret ring by 3 tubular brackets.. (Fig. 2).

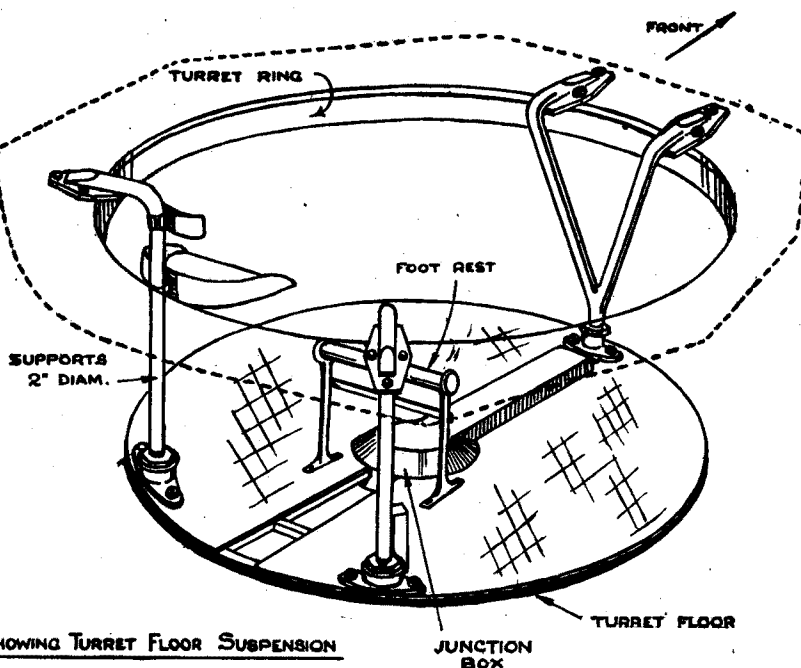


Fig. 2 SKETCH SHOWING TURRET FLOOR SUSPENSION

The electrically operated power traverse gear consists of an auxiliary petrol engine, driving a generator set situated in the near-side of the engine compartment. The electric supply is taken via a rotary junction to the power traverse motor attached to the traverse gear on the left of the turret. The current supply is controlled by a trigger switch on the hand traverse wheel. The controller unit is operated by a chain and sprocket drive from the hand traverse wheel.

A lever on the traverse gear box provides for hand or power control. The auxiliary engine is a water-cooled, two-cylinder two-stroke Auto-Union engine. Ignition is by flywheel magneto. The carburettor is supplied by gravity from an auxiliary tank mounted on the engine bulkhead. Cooling is effected by a tapping of the water circulation of the main power unit. (Fig. 15)

The manual traverse is operated by a handwheel on the left of the 7.5 cm. gun. 180 turns of the handwheel are required for complete traverse. A plunger type turret lock on the right rear of the gunner secures the turret in a straight ahead position for travelling.

Turret Position Indicator

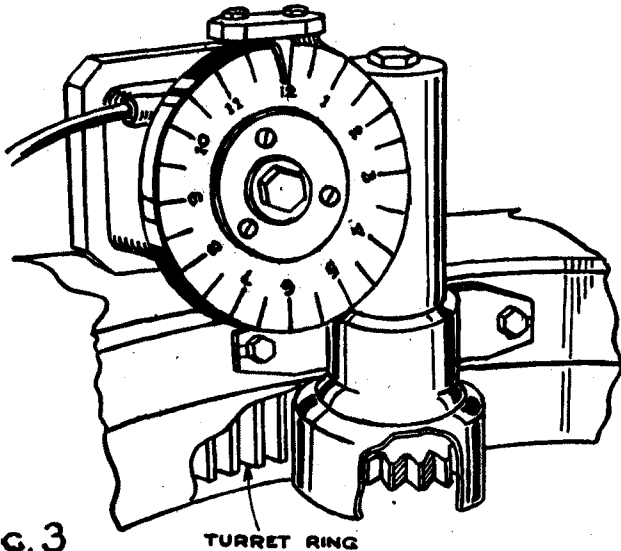
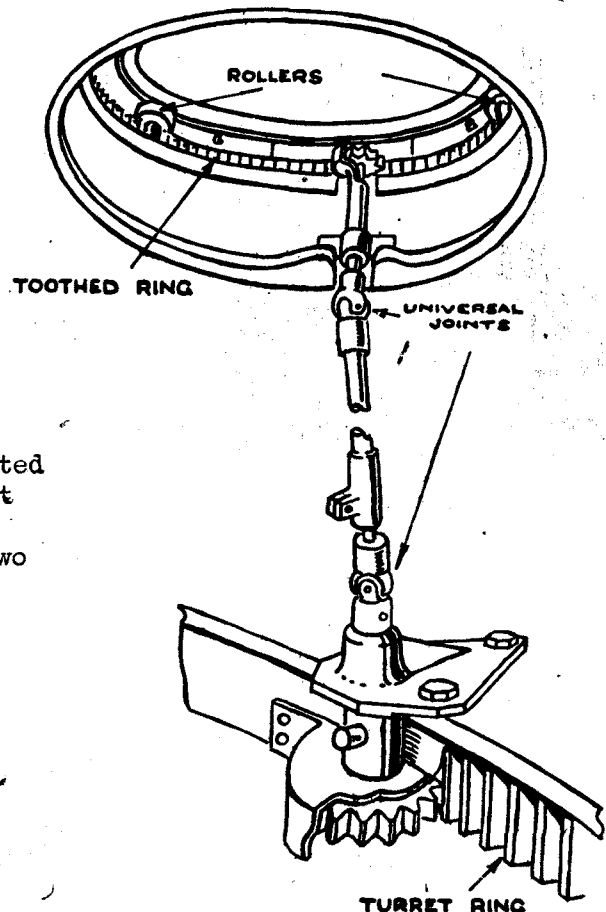


Fig. 3

TURRET RING

A dial graduated 1 - 12 on the left of the gunner is geared to the turret and indicates the position of the turret. (Fig. 3). Another gear drives an annular toothed ring in the cupola through a universally jointed shaft. (Fig. 4). This ring is also graduated 1 - 12. There is a fixed pointer on the outside of the cupola scale corresponding with the figure indicated on the gunner's dial (Fig. 3). By this means the commander is able to indicate to the gunner the approximate position of the target.



Cupola - The cupola is fitted to the top rear of the turret having an inside diameter of 1'7". The top consists of two semi-circular hinged flaps.

Fig. 4

II. OBSERVATION

Superstructure - Driver's vision is provided by a single slitted visor with easily removable glass block (deficient) measuring $9\frac{1}{2}$ " x $2\frac{7}{8}$ " x $3\frac{1}{4}$ " thick, and protected by B.P. flaps. Two further vision slits are provided in the side plates, one on the off-side and one on the near-side. Each of these is fitted with readily removable glass blocks (deficient) measuring $5\frac{7}{8}$ " x $2\frac{7}{8}$ " x $2\frac{7}{8}$ " thick, and B.P. flaps.

Turret - Two observation ports in the turret front, each fitted with readily removable glass blocks, measuring $5\frac{7}{8}$ " x $2\frac{7}{8}$ " x $2\frac{7}{8}$ " thick and B.P. flap. (Glass blocks deficient). There are also two observation ports in the turret sides forward of the hatches, the off-side port is provided with readily removable glass block (deficient) measuring $5\frac{7}{8}$ " x $2\frac{7}{8}$ " x $2\frac{7}{8}$ " thick and B.P. flap. The off-side port has B.P. flap but glass block is not fitted. Two similar ports are provided in the turret hatches themselves and the glass blocks of these are also deficient.

Cupola - Five equally spaced observation ports are provided in the cupola, giving all round vision (Fig.5). These are fitted with readily removable glasses measuring $5\frac{7}{8}$ " x $2\frac{7}{8}$ " x $2\frac{1}{2}$ " thick, and are protected by heavy sliding B.P. covers, operated by spring loaded locking bar working in quadrants. Three positions of opening are provided on the quadrants but a band clamped round the outside of the cupola limits the opening to two positions (Fig. 6).

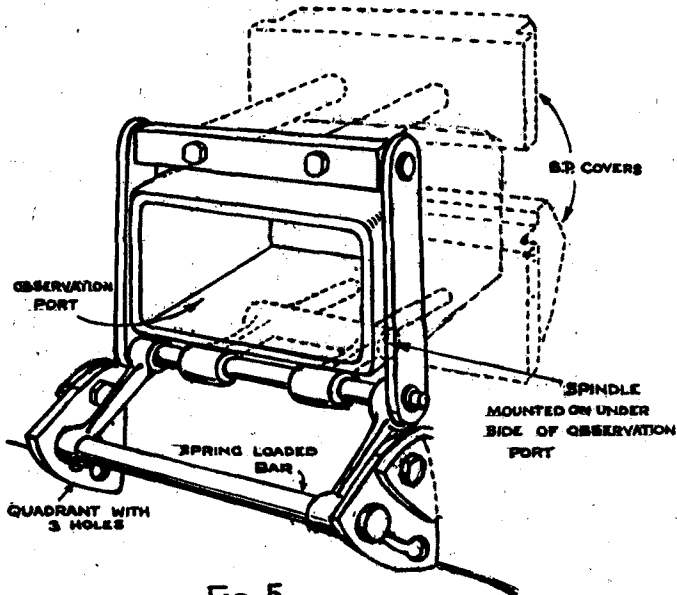


Fig. 5

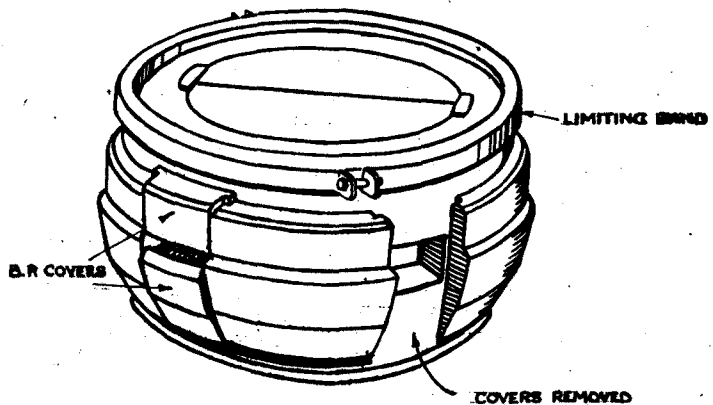
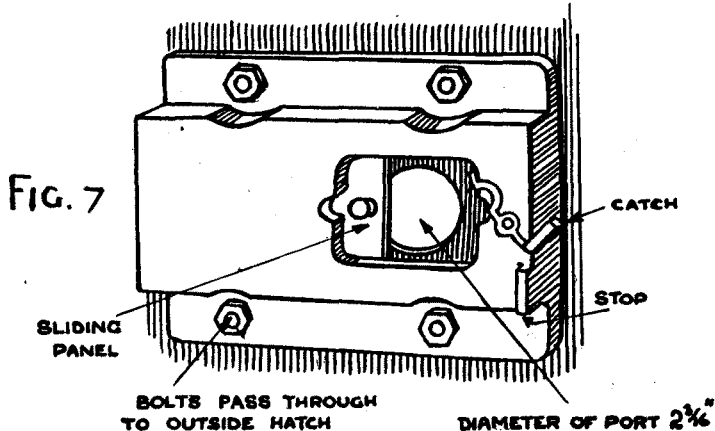


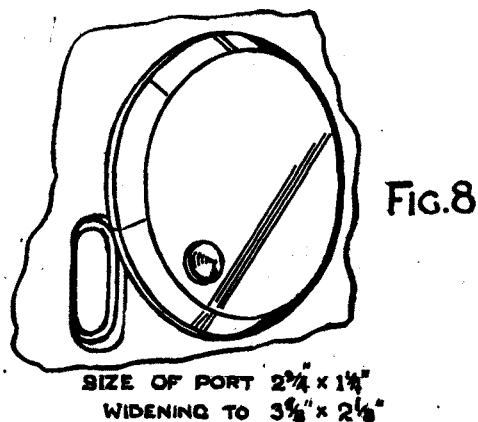
Fig. 6

12. PISTOL PORTS

In turret. Four are provided - two with sliding B.P. shutters in the side escape doors (Fig.7) and two in the rear plate, with circular B.P. flaps (Fig.8).

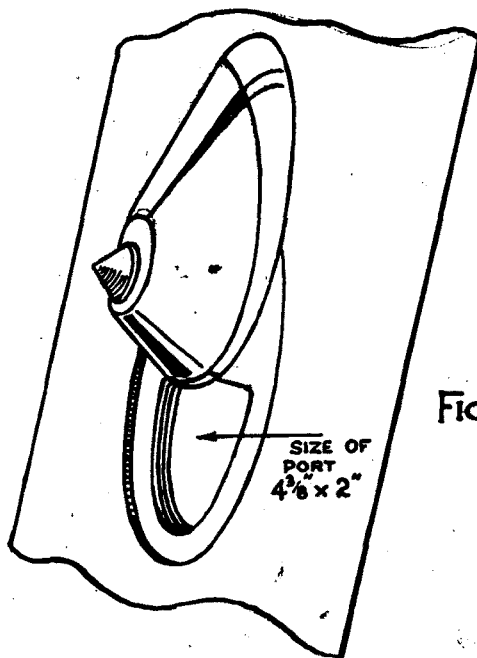


PISTOL PORT IN TURRET SIDE DOORS
AS SEEN FROM INSIDE THE TURRET.



PISTOL PORT
IN TURRET REAR PLATE

In Superstructure. A semi circular pistol port with B.P. cover is fitted to the right of the driver (Figs. 9 and 10).



PISTOL PORT IN
FRONT VERTICAL PLATE
AS SEEN FROM FRONT OF TANK. IT IS
ON THE DRIVER'S RIGHT.

13. ESCAPE HATCHES & ACCESS DOORS

In addition to the doors in the top of the cupola there are two escape hatches in the top front plate of the superstructure each measuring $1'7\frac{1}{2}"$ x $1'2\frac{1}{2}"$, one for the driver and one for hull machine gunner. These hatches are provided with circular ports of $5\frac{1}{2}"$ diameter, with B.P. covers. In the front glacis plate there is a further access plate, secured by square headed counter-sunk set screws. This plate gives access to gearbox oil cleaner and to bevel box.

Two doors are provided in the near-side hull plate for access to petrol filler caps. The turret is provided with two doors each measuring 20" x 16" one in each side plate. An access door for adjustment of fandrive is provided in tail plate.

A small hinged door is provided in near-side engine cover plate for access to radiator filler cap.

14. ARMOUR

	BASIC	EXTRA	ANGLE
A. Cupola top	7 mm.		Horizontal
B. " front and sides	50-95 mm.		Round.
C. Turret top front	10 mm.		82°
D. " " rear	10 mm.		Horizontal.
E. " sides	21 mm.		24°
F. " rear	21 mm.		14°
G. " front (40 mm. behind mantlet)	30 mm.		9°
H. Gun Mantlet	35 mm.		Round.
J. Front vertical plate	30 mm.	30 mm.	7°
K. Glacis plate	21 mm.		71°
L. Front nose plate	50 mm.		15°
M. " lower nose plate	Not measured		28°
N. Side superstructure	21 mm.	20 mm.	Vertical.
P. Side hull plate	21 mm.	20 mm.*	Vertical.
Q. Top front plate	12 mm.		84°
R. " rear "	12 mm.		Horizontal.
S. Rear engine cover plate	10 mm.		87°
T. Observation cover plates	varying 20-23mm.		-
U. Belly plate (middle)	10 mm.		Horizontal.
" " (rear)	10 mm.		74°
W. Tail plate (upper)	21 mm.		15°
" " (lower)	Not measured		10°
X Skirting plates	Not fitted		

(The "Angle of Plate" given is the angle between the plate surface and the vertical, which is equal to the "Angle of Impact" for horizontal attack).

*The extra plate is fitted to the centre portion of the hull giving extra protection to the fighting compartment only.

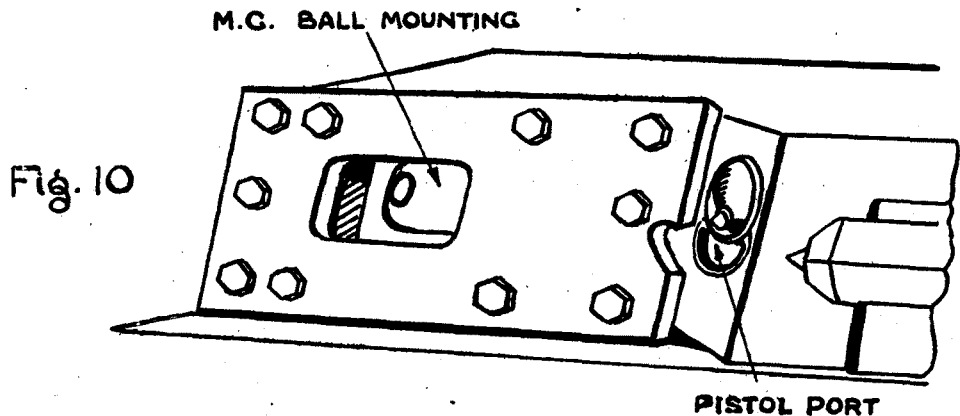
The hull and turret are of the orthodox German design embodying all welded construction and the usual arrangement of welded joints.

Although this is the largest of German A.F.V's. examined to date, the vehicle is conspicuous by its bulk rather than by the standard of armour protection. The vehicle has in fact a very light basic armouring. An effort has been made to improve the standard of armouring by thickening up at:

- (a) Front vertical plate (Front gunner's section).
- (b) Side hull plates (centre section only).
- (c) Side superstructure.

The additional armour seems to have been fitted mainly for the purpose of protecting the fighting compartment. It may have become necessary to do this because of the location of petrol tanks in the floor of the compartment and the stowage of ammunition behind the side superstructure. The additional protective plates have been secured by conical-headed bolts.

It is interesting to note the arrangement whereby the hull superstructure is built out over the tracks. This gives stowage space and a wide base upon which to mount the turret so that a large turret ring can be used, and turret ring protection can be fitted. The turret is offset $2\frac{1}{2}$ " to the near-side, this has most probably been done from a point of view of weight distribution as the engine and transmission shaft are arranged about 5" on the off-side. This layout has made complete turret ring protection impossible and a short length of protector strip at the extreme width on the near-side has been omitted.



The additional armour on the front gunner's vertical plate has been fitted slightly spaced (Fig. 10). This method of construction may have been chosen because of the greater ease in fitting to clear the gun mounting rather than for Ballistic reasons.

There is no evidence to show that face hardened armour is used although there is some variation in the hardness of the various plates. The following are approximate figures of hardness as measured by the "Poldi" hardness tester :-

Front nose plate	280 to 300 Brinell	} According to thickness & location of plates
Turret side armour	} 280 to 370 Brinell	
Glacis plate		
Additional side superstructure armour	} 270 to 350 Brinell	
Additional side hull armour		

Attention has been paid to the problem of splash protection. Escape doors are fitted with the customary splash channels. Formed splash guards of sheet steel are fitted internally at the top and the bottom of the mantlet aperture.

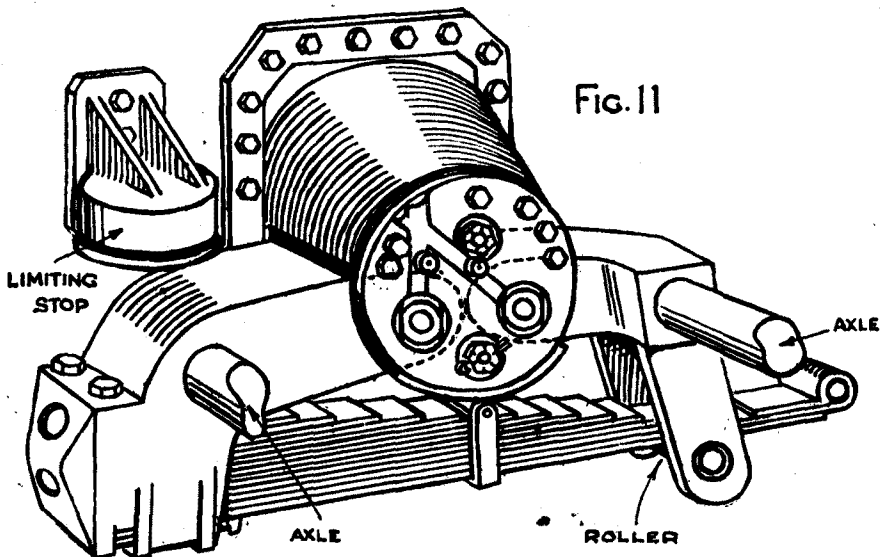
The vehicle has received a number of hits, most probably by 2-pdr. A.P. shot. Three perforations have been made in the rear, these have done considerable damage in the engine compartment and have put the vehicle out of action. There are three hits on the front nose (50 mm) plate and although none have perforated, one has made a deep scoop but without causing internal damage. This scoop must have been considered of sufficient depth to warrant attention, as a patch had been welded on to break away again later, probably because of bad welding or perhaps because of the hardness of the nose plate.

Further evidence of field repairs by welding is to be found in the port door for the petrol filler cap in the near-side hull plate, where a rough but apparently satisfactory job has been done by using a hinge and section of door most probably cut from a Pz.Kw. III driver's escape door.

15. SUSPENSION

Four bogie assemblies, each fitted with two twin rubber tyred steel wheels are fitted each side. The tyres as marked "Continental 470/75-660".

A quarter elliptic leaf spring is anchored to the underside of the leading axle arm. The other end of the spring rests on a roller on a shackle pin in the trailing arm. Limiting stops are fitted to the hull for each leading wheel. A limiting stop for the trailing wheel is provided only for the rear bogie assembly. (Fig. 11). There are four return rollers.



16. TRACKS

Single pin secured by cotter. (Fig. 12).

Material (Cast - non magnetic)

Width of shoe $14\frac{1}{4}$ "

Pitch of shoe $4\frac{1}{4}$ "

Shoes per track 99

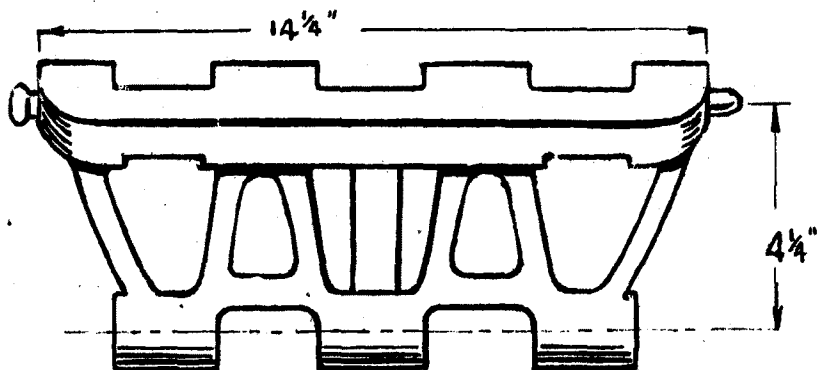
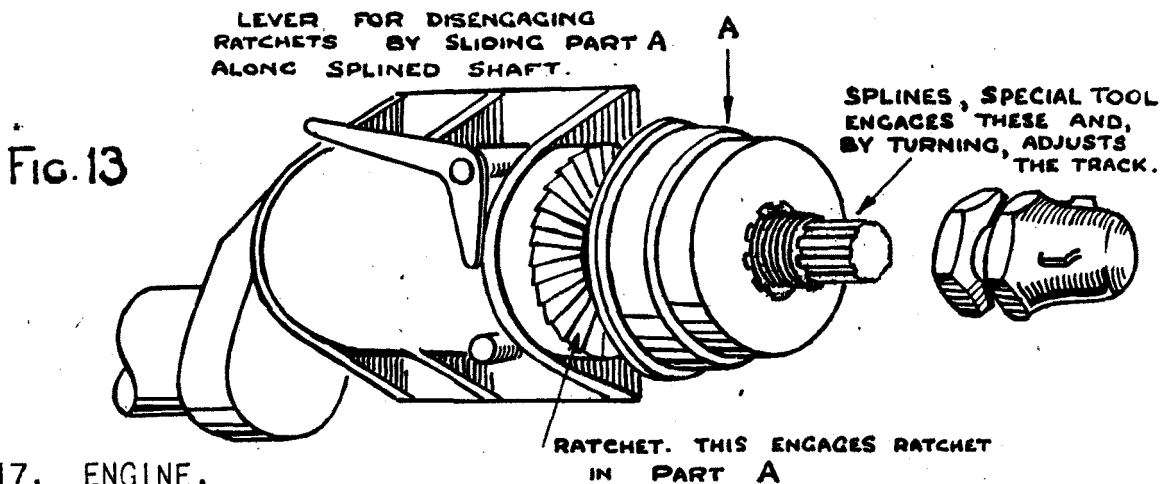


Fig. 12

Track Adjustment - By eccentric mounting of rear idler. A special tool engages splines in the shaft and adjustment is retained by a ratchet ring, secured by a hexagon nut and domed lock nut (Fig.13).



17. ENGINE.

Maker Maybach. Motorenbau. Motor No. 540455 - 1940

Type V 12. O.H.V.

Fuel Petrol

Valves Operated by two overhead camshafts. Two inclined valves per cylinder actuated through roller type rockers. Adjustment is by rotation of eccentric bushes on rocker arms. Camshafts driven from helical timing gears.

Carburetors

Solex Duplex downdraught type mounted between the cylinder blocks.

Petrol Taps The petrol tap control panel is mounted on the rear bulkhead of the fighting compartment.

Petrol Pumps Two mechanical type situated on near-side of engine. A Solex hand operated diaphragm type primer is mounted on the centre of the rear bulkhead in the fighting compartment.

Fuel Capacity Three petrol tanks mounted under turret floor. (Messrs. Leyland's report gives capacity as 105 gallons) A tank for power traverse petrol generator set under top rear plate of superstructure has capacity of $2\frac{1}{2}$ gallons.

Air Cleaners A large air cleaner of oil bath type, is mounted beneath the fans on the off-side of the engine. This will be the subject of a special report and issued as an appendix.

Ignition Bosch magneto. Driven off timing gears at rear of engine.

Dynamo Situated on off-side of engine and driven by single Vee belt off crankshaft. (Fig. 16).

Starters Inertia starter on near-side of engine. Orthodox electric starter on off-side.

Accumulators Deficient. Carried under floor of fighting compartment on off-side.

Cooling Radiators, water-pump and fans.

Radiators Two film type, marked respectively :-

Rear Radiator - Hans Windoff. Apparate und Maschinenfabrik - 9
Aktiengesellschaft - 40
Berlin - Schineberg.
Kohl.Nr.73155. Com.Nr.42743.

Forward Radiator - Hans Windoff. Apparate und Maschinen Fabrik - 8
Aktiengesellschaft - 40
Kohl.Nr. 72142 Com.No.42742 - 32

The radiators are coupled and mounted side by side at an angle of 25° from horizontal, immediately under the near-side rear engine cover plate. Filler cap is on the rearmost radiator and accessible through access plate in engine cover plate (Fig. 14 and 15).

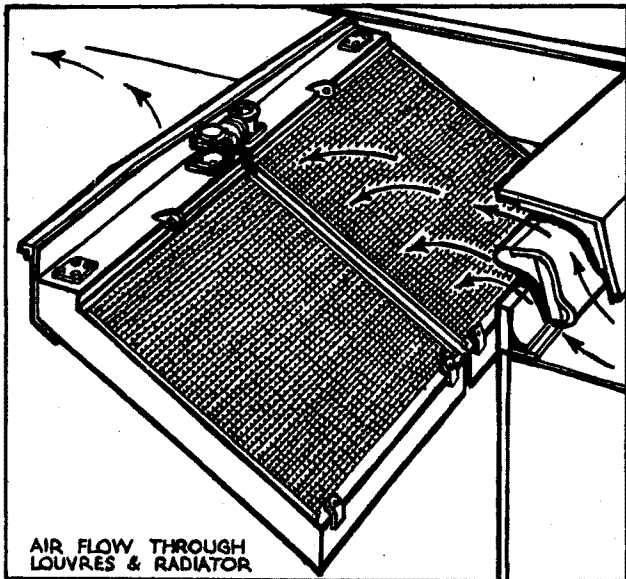


FIG. 14

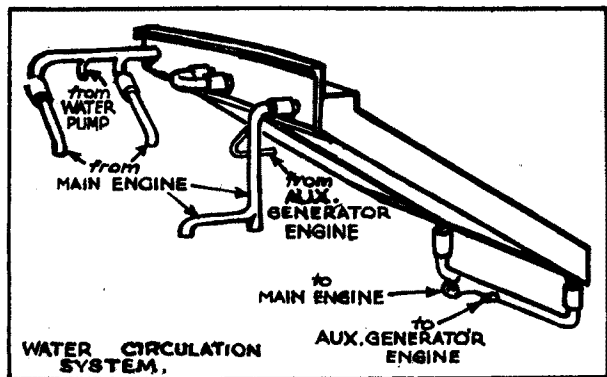


FIG. 15

Fandrive Two fans running in aluminium cowlings are mounted on the underside of the off-side rear engine cover which is hinged for access. The fans are driven from a universally jointed shaft through two bevel boxes. The driving shaft is driven by triple V belts from the crank shaft via a distributing pulley. (See Fig. 16).

Adjustment is provided by jockey pulley - a hand-nut being accessible through upper tail plate.

To allow the engine cover and fan assemblies to be raised a splined quick release device is incorporated, and is accessible through the tail plate. (See Fig. 17).

Water Pump Of impeller type. Belt driven off crankshaft, via distributing pulley. (Fig. 16). Mounted on engine between head.

Lubrication System Dry sump - Oil cannister on off-side of engine. Filler is accessible through rear of fighting compartment.

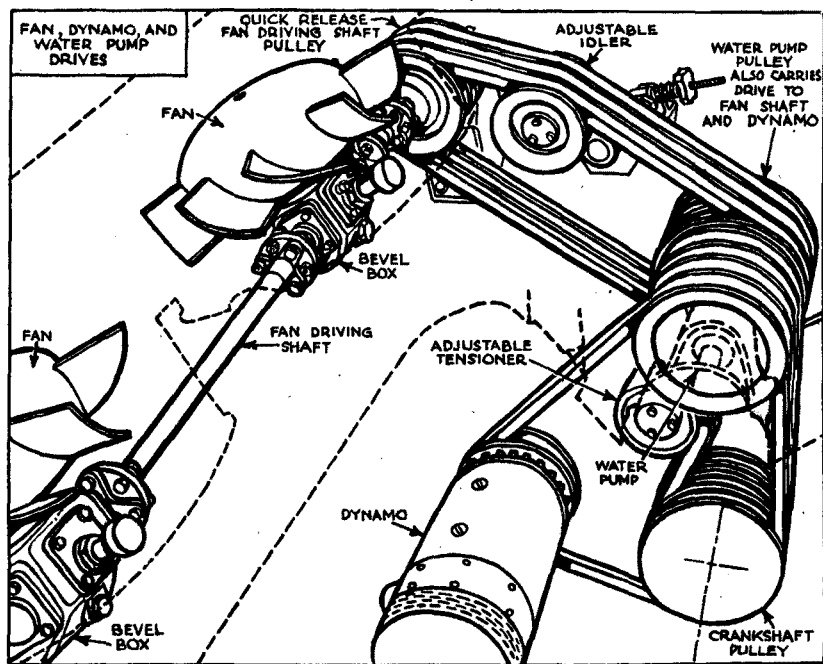


Fig. 16

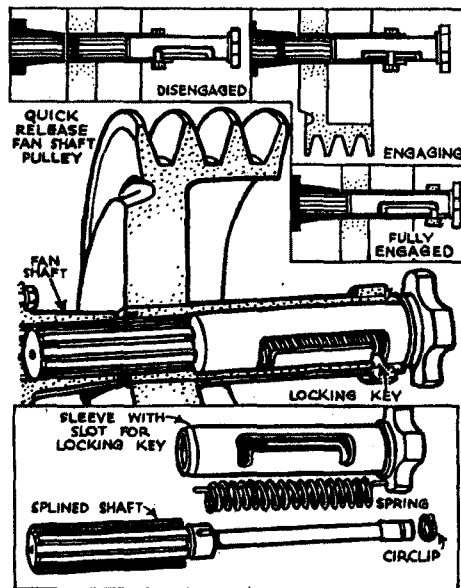


Fig. 17

18. GEAR BOX AND TRANSMISSION

From the engine the drive is taken via the propeller shaft to the clutch mounted at the rear of the gearbox, which is of manual type with six forward speeds and one reverse. The gear lever is mounted on the right of the driver. Oil filler is situated on the near-side. An oil cleaner of the Auto-Klean type is mounted on top of gearbox.

19. STEERING

From the gearbox the drive is taken through a bevel box and cross-shafts to each steering unit. Universal joints are incorporated in the cross-shafts. The steering units are of epicyclic type operating on the clutch brake principle.

The track brakes are mounted alongside each steering unit. The cooling of the steering units is effected by a centrifugal fan mounted at the rear of the clutch housing which draws air from the brake drums, via a sheet metal duct to an outlet on the near-side of the superstructure.

20. DRIVE

From the steering units the drive is taken to reduction gears and thence to driving sprockets.

Height of sprocket	2' 4" (to centre)
Pitch diameter	2' 7"

21. COMMUNICATION

There is a spring loaded mounting for wireless aerial on off-side of superstructure.

22. INSTRUMENTS AND CONTROLS

On instrument panel over gear-box.

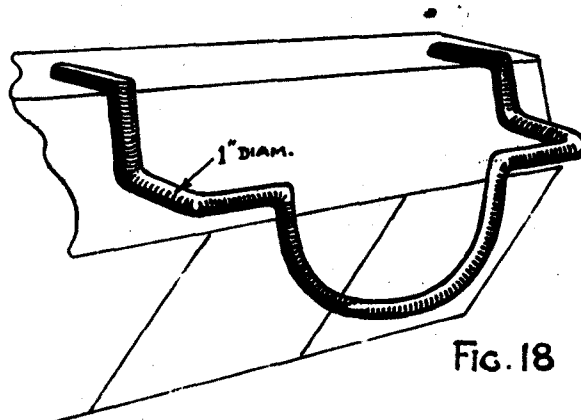
Speedometer - Calibrated 0-50 kph. Total reading 4465 km.

Oil pressure gauge - Graduated 0-6 Kg.Cm²

Provision is made for three instruments in the panel. These are deficient and are presumably - revolution counter, water temperature gauge, starter switch and ammeter.

23. OUTSIDE STOWAGE

The usual variety of clips for fire-fighting appliances, de-ditching gear etc. are provided. A large rough stowage box is mounted on brackets at rear of turret. Stirrups of 1" round section are fitted to the sides of rear engine cover for the carriage of spare bogies - one on off-side and one on near-side. (Fig. 18).



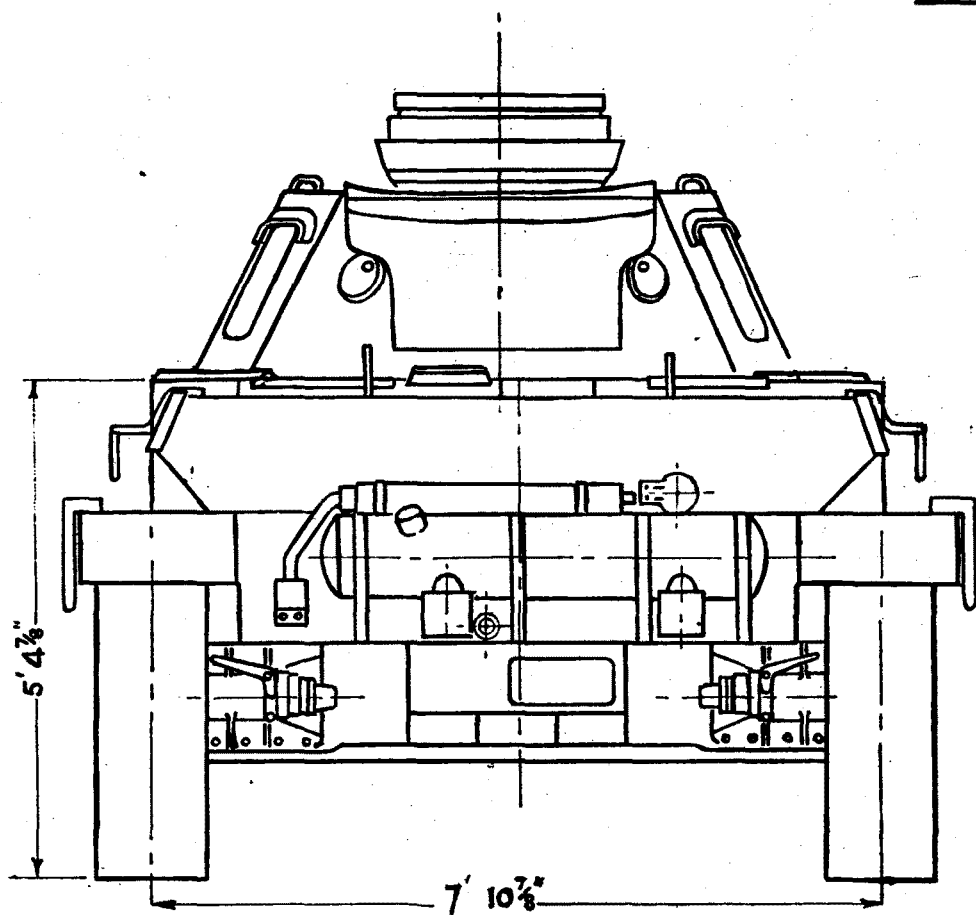
24. VULNERABLE POINTS

Vulnerable points on this model are the sides (except the centre section of the hull and superstructure between the 2nd and 7th bogie wheels) and the rear, where there is only 21 mm. armour. The turret ring has no protection on the near side and will be vulnerable to jamming by S.A.A.

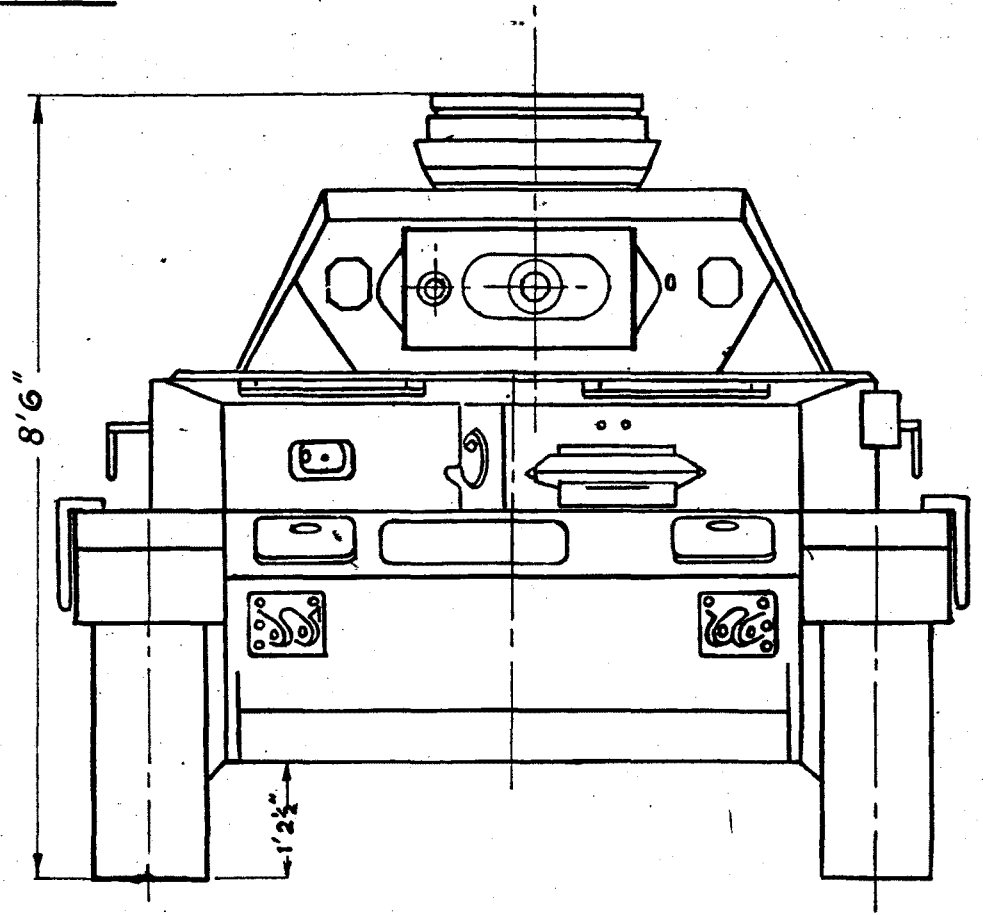
Air intakes and outlets. Air is taken through louvres in the near side rear superstructure (engine compartment) and a slatted rectangular opening on the near side engine cover plate. Air is expelled through similar louvres and opening on the off-side.

The louvres on each side of the rear superstructure are faced with wood and covered by a thin metal sheet. This is to prevent ricochet into the engine compartment.

Pz. Kw. IV



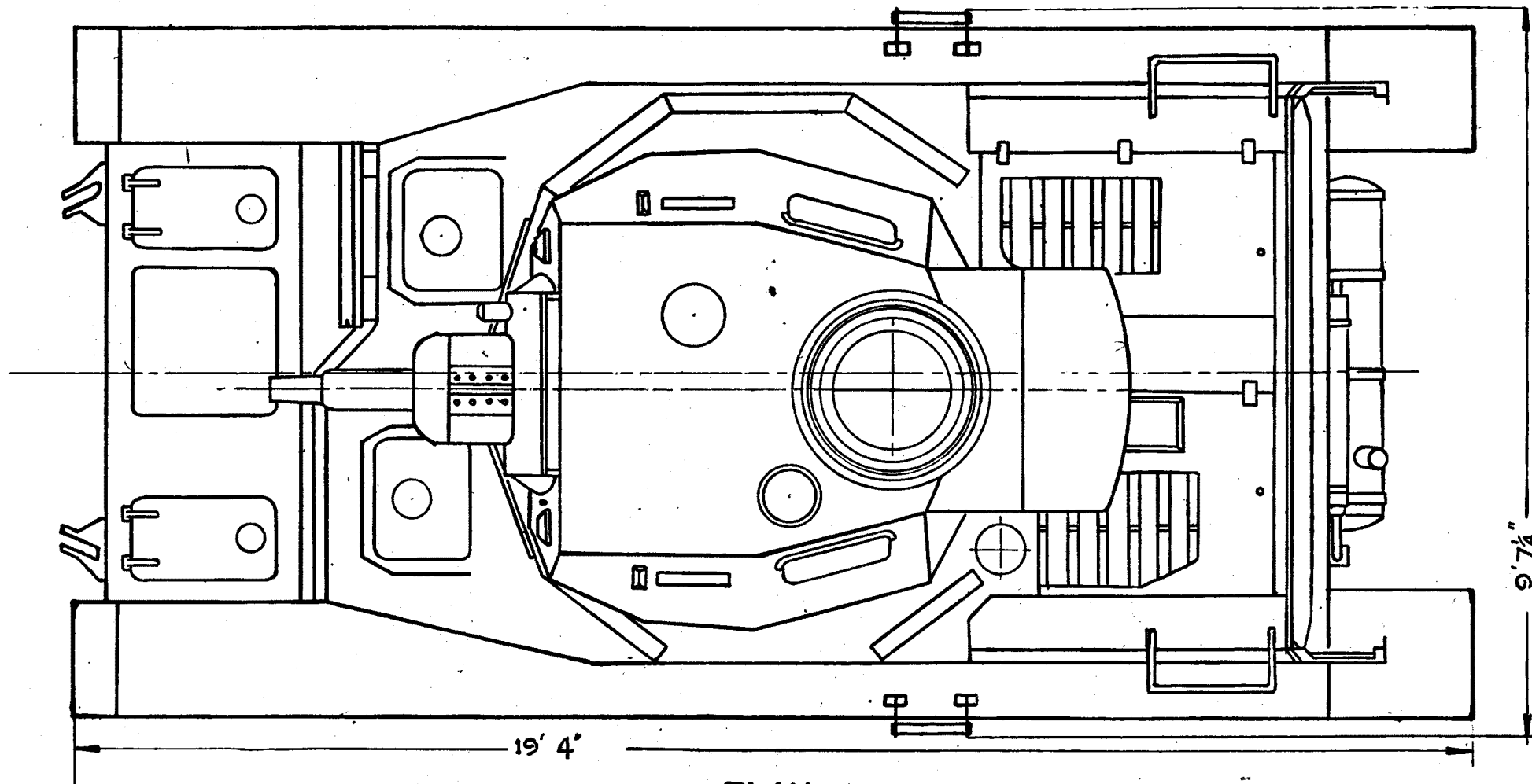
REAR VIEW



FRONT VIEW

	Pz. Kw. IV
	DRAW ^e N ^o . 139
F 7	C.G.P. 12/42
	S.T.T. 8/2/6

Pz. Kw. IV

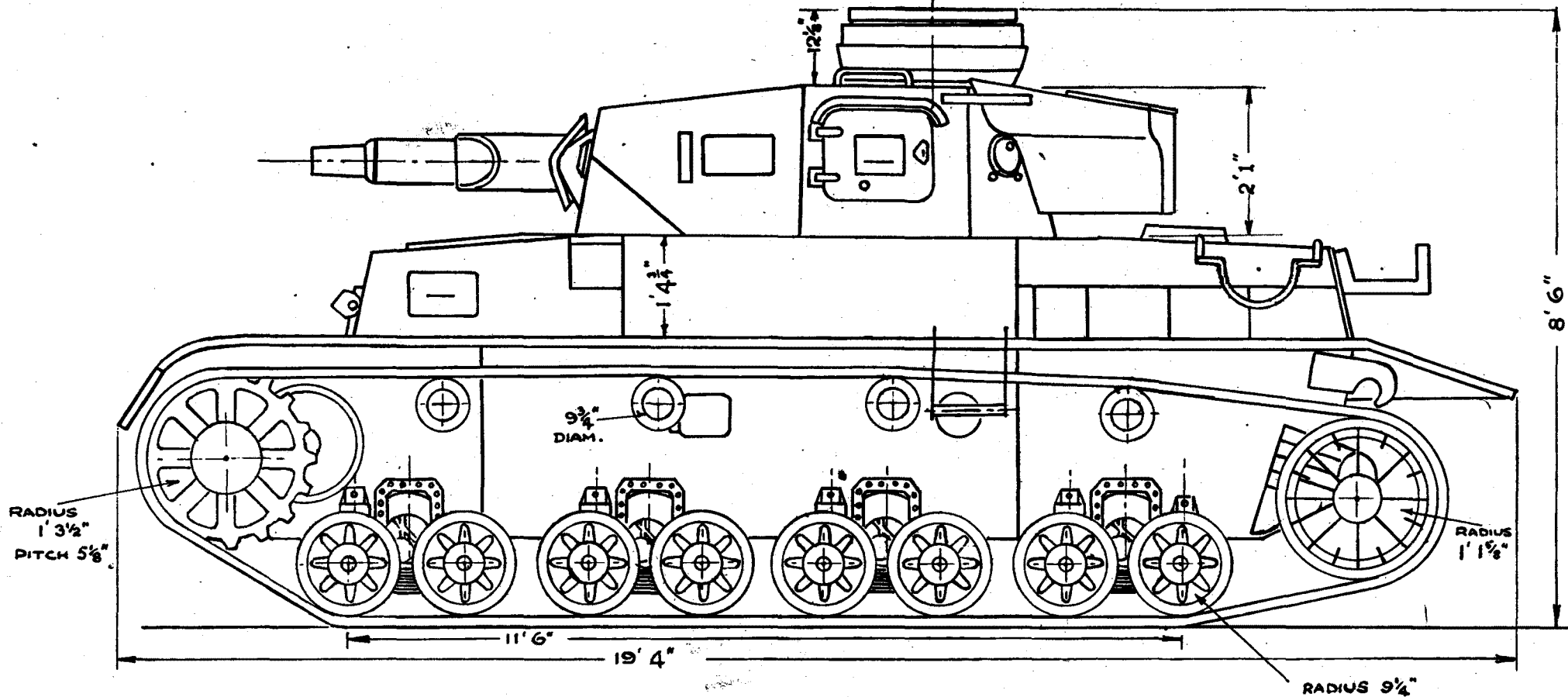


PLAN

Pz. Kw. IV
DRAW ^g N° 138
C.G.P. 12/42
ETT 8/2/46

F7

Pz.Kw. IV



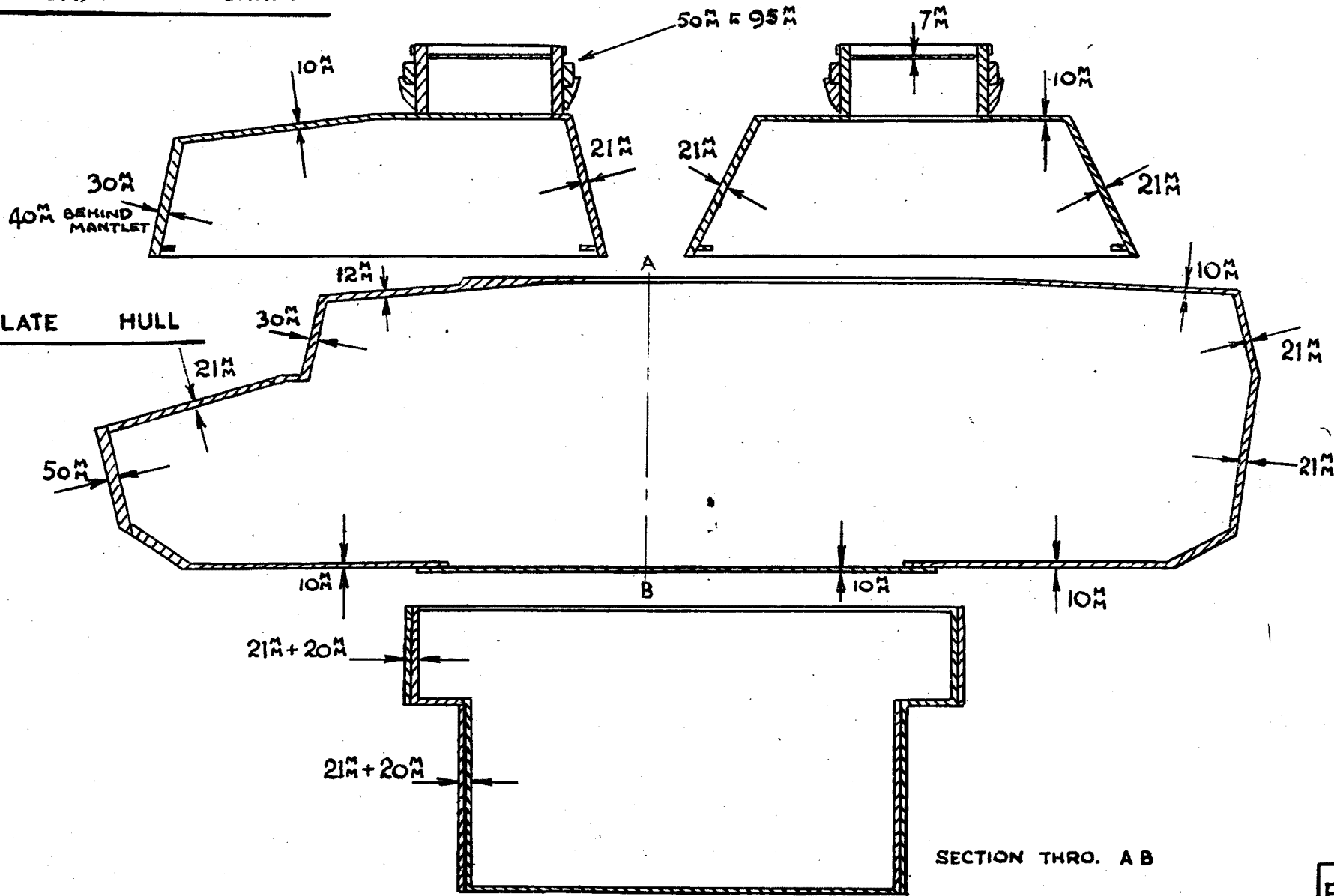
SIDE VIEW

	Pz.Kw. IV
	DRAW ^c N° 137
F7	C.G.P. 12/42
	S.T.T. 8/2/6

Pz.Kw.IV

ARMOUR PLATE

TURRET



SECTION THRO. A B

F6	Pz.Kw. IV
	DRAW ^c N° 140
	C.G.D. 12/42
	S.T.T. 8/2/8