air bubbles are broken up; the air being drawn out of the engine via the breather pipes and the oil draining back to the sump.

OIL FILTERS.

Two Tecalemit oil filters are provided, situated on top of the engine; one at the flywheel end of each induction manifold. The oil is cleansed by passing through a fabric element. The filter casing has a detachable top cover plate to permit removal of the element. The ends of the element are enclosed by cup shaped metal discs, a spring between the upper disc and the cover plate prevents leakage. A non-adjustable relief valve is incorporated so that oil can by-pass the element when the oil is cold or if the element becomes choked.

OIL COOLER.

The oil is cooled by passing through the induction manifold jackets and the oil filters, the casings of which are finned to assist cooling.

BREATHERS.

The crankcase is ventilated by two breather pipes which are connected from the cover plate on top of the crankcase under the starter motor to the carburettor air intake pipes. A perforated baffle and wire gauze is fitted in the cover plate to prevent oil being drawn from the crankcase and also act as a flame trap in the event of a blow back through the carburettors.

MAINTENANCE.

The oil level should be checked daily or every 75 miles. The engine oil must be changed and the filters cleaned every 500 miles.

For full adjustment and maintenance see page No. 27.

CARBURETTORS.

Two Zenith or two Solex Carburettors are fitted on top of the engine, one for each block of six cylinders.

ZENITH HIGH ANGLE CARBURETTOR, TYPE 36-T.T.H.V.1.

This instrument is of the horizontal pattern, and belongs to a series developed especially for vehicles required to operate over open country and negotiate exceptionally steep hills or other obstacles.

An engine fitted with one of these special instruments can be inclined to an angle of 45° in any direction without danger of petrol flooding or dripping away from the carburettor, with consequent risk of fire, and the jet system is so arranged that a correctly proportioned air fuel mixture is provided at all angles up to 45°.

The engine will start from cold, idle in a satisfactory manner and accelerate up to a maximum speed, notwithstanding the fact that it may be inclined in any direction up to an angle of 45°.

The well known system of main jet, compensating jet and slow running jet with outside regulation of the slow running mixture has been retained.

The carburettor is composed of three principal parts, the barrel or air intake, the float chamber or bowl embodying the central jet carrier, and the float chamber cover attached to which are the double floats, needle valve and slow running jet system.

THE BARREL.

It will be observed (*Fig.* 1) that the outlet of the petrol/air emulsion metered by the carburettor is by means of a small central venturi (1) mounted so as to register with the centre of the main choke tube or venturi (2).

This arrangement ensures instantaneous acceleration and complete freedom from flat spots at the bottom end of the engine speed range, together with absolute maximum power at the top end of the range.

The centre venturi (1) is held in position by the screw (5) locked by the hexagon nut (6).

The choke tube (2) is held in position by the retaining screw (7).

The purpose of the butterfly throttle valve (3) is to control the admission of petrol/air mixture to the intake manifold. The orifice (4) registers with the edge of the throttle valve when it is in the closed or nearly closed position, and is the outlet of the mixture from the slow running system.

To operate, the Commander uses his periscope in a normal manner, and on sighting the target he switches on the indicator and rotates the periscope to keep the target on the centre line of the vision block.

The gunner immediately rotates the turret in the direction indicated by the lights, i.e. green arrow showing, traverse right, and red arrow, traverse left. Indication that he has layed the gun on the target sighted by the Commander is the extinguishing of the light. Should he overshoot the position the opposite colour will show, and reversing direction as indicated by the colour will give correction. When the gun is at 180° to the periscope, both lights will show and it is immaterial which way the turret is rotated, but at all other positions the direction as indicated by the light is the shorter way. A separate fuse is fitted to protect the gunnery indicator circuit. This is situated adjacent to the Commander's switch. The correct size for this fuse is 36 gauge copper wire.

INTERNAL COMMUNICATION EQUIPMENT.

The tank is fitted with a telephone set, A.F.V. which enables the Commander to communicate with members of the crew whether wireless is or is not fitted.

A telephone set, A.F.V. comprises:—

A switch unit complete with 4½ volt dry battery.
A hand microphone.
Receivers, headgear (headphones).
Telephone jacks adjacent to each crew member.
Wiring and terminal blocks.

The switch unit Mark II consists of a box with a telephone key switch giving three positions, a microphone transformer, a 4½ volt dry battery, a battery regulating resistance for varying the microphone current, jack sockets and terminals.

Each "jack telephone" is a metal cylinder, 7½in. long by 1¼in. diameter, suspended from a hook adjacent to each crew member. It contains a telephone jack into which can be plugged the plug, single, No. 9 of a receiver headgear.

There are two leads from each jack. One is connected to a terminal on a hull batten and the other, of copper braid, is earthed.

SWITCH POSITIONS.

There are three positions for the switch which the Commander, when wireless is fitted, must operate according to whether he wishes to speak to the crew, speak on the main wireless set, or communicate on the local communication wireless set.

(*a*) "I.C." Position of Switch.

This allows the Commander to speak to the crew (excluding the wireless operator) and to listen in on the main wireless set. He hears a faint side tone of his own speech.

(*b*) A.R/T Position.

This allows the Commander to listen or speak on the main wireless set and to speak to the wireless operator.

The crew receive a faint side tone of all communications over the main wireless set, not enough for them to understand the speech, but sufficient to know that it is taking place.

(*c*) B.R/T Position.

This allows the Commander to listen or speak on the local communication wireless set (Wireless Set No. 14) and to speak to the operator of this set. The crew also receive a faint side tone of these communications.

Note—The side tone may not be heard when the vehicle is moving.

WORKING INSTRUCTIONS.

(*a*) Plug the appropriate microphone and telephones into the switch unit and jacks for the vehicle in question; plug the appropriate connectors in to the wireless set. The connectors between wireless set and switch unit are part of the wireless set equipment.

(*b*) With the key switch of the switch unit set at "I.C." speak into the microphone and ensure that good speech is receivable at all points in the system. Faint side tone should be received by the Commander in his own headphones when speaking into the microphone.

(*c*) Switch the wireless set(s) in turn to "SEND" and adjust the appropriate controls for maximum radiation. Set the key switch of the switch unit to "A.R/T" or "B.R/T" as required, and ensure that clear speech is being transmitted by adjusting the modulation control on the wireless set and noting the deflection in the aerial current ammeter. Side

DRAINING ARRANGEMENTS.

A tap for draining the complete system is fitted in the centre of the radiator bottom tank, and is reached by removing a cover plate which is fixed to the hull by six set screws immediately beneath the radiator. Pipes from the bottom of each water pump, and the centre transfer pipe on the lower side of each cylinder block, are connected together and run into each radiator outlet pipe, thus ensuring that the system is completely drained from the one point at the bottom of the radiator.

WATER PUMP.

There is no adjustment for the water pump gland. Should the gland leak, this can only be remedied by replacing the complete seal. To do this, proceed as follows:—

1. Drain water from cooling system.
2. Remove dynamo, as described on page 39.
3. Remove pump outlet and inlet pipes, and undo union connecting pump drain pipe to pump body.
4. Remove pump body end cap. Unscrew impeller cap nut (left hand thread), impeller spindle nut (right hand thread) and impeller (left hand thread).
5. Remove pump body and tap the seal out of the housing.

Replace in reverse order.

FAN BELTS.

The fan belts should be checked every 250 miles. The correct tension is when the belt can be moved up and down approximately $\frac{1}{2}$" in the centre between the pulleys.

To adjust the fan belt, slacken off the nut on the bolt securing each fan mounting bracket (to allow the brackets to swing freely) and undo the lock nut which connects the lower end of the fan brackets (see Fig. No. 4). This lock nut is situated on the outside of the right hand trunnion when facing the rear of the vehicle. To tighten the belts turn the rod clockwise by means of the fan adjusting nut on the right hand end of the rod. Tighten up the lock nut again after the correct tension has been obtained, and re-tighten the nut on each fan mounting bracket securing bolt. This single adjustment tensions both belts. Should the sides of the belt be worn or frayed the belt should be replaced.

Care should be taken to keep the fan belts free from oil, as oil on the belt will produce excessive slip and is also detrimental to the rubber.

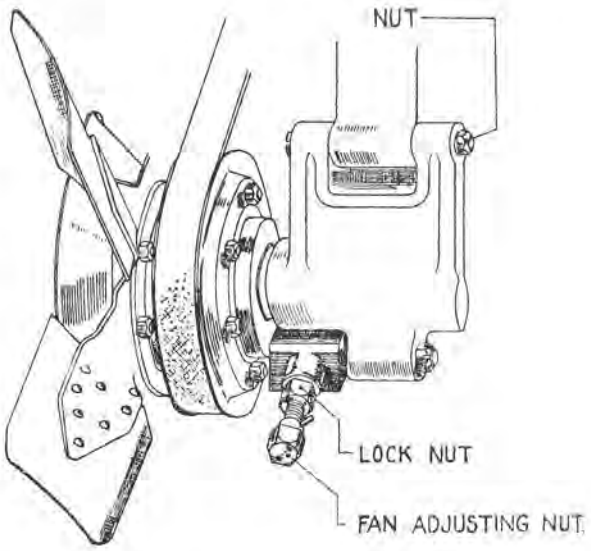


Fig. 4. **Fan Belt Adjustment.**

REMOVAL AND REPLACEMENT OF FAN BELTS.

Removal.

1. Remove radiator as described on page 38.
2. Slack off fan adjustment and remove belts.

Replacement.

1. Replace fan belts and adjust to correct tension.
2. Replace radiator as described on page 38.

FAN SHAFT BEARINGS.

The fans run on sealed type ball bearings which are filled with a lubricant on assembly and require no attention between engine overhauls.

RADIATOR.

It is important that the radiator tube block is kept free from oil and dirt. The air passages through the tube block are very small and oil or dirt on the tubes and gills of the block will lead to a considerable reduction in efficiency, due to the choking of the small air passages. The most likely cause of this trouble is an oil leak from the engine, as any oil which leaks from the engine will, because of the direction of the air stream, eventually find its way to the radiator; when this

PLATE No. 1.

ENGINE CLUTCH AND CLUTCH STOP.

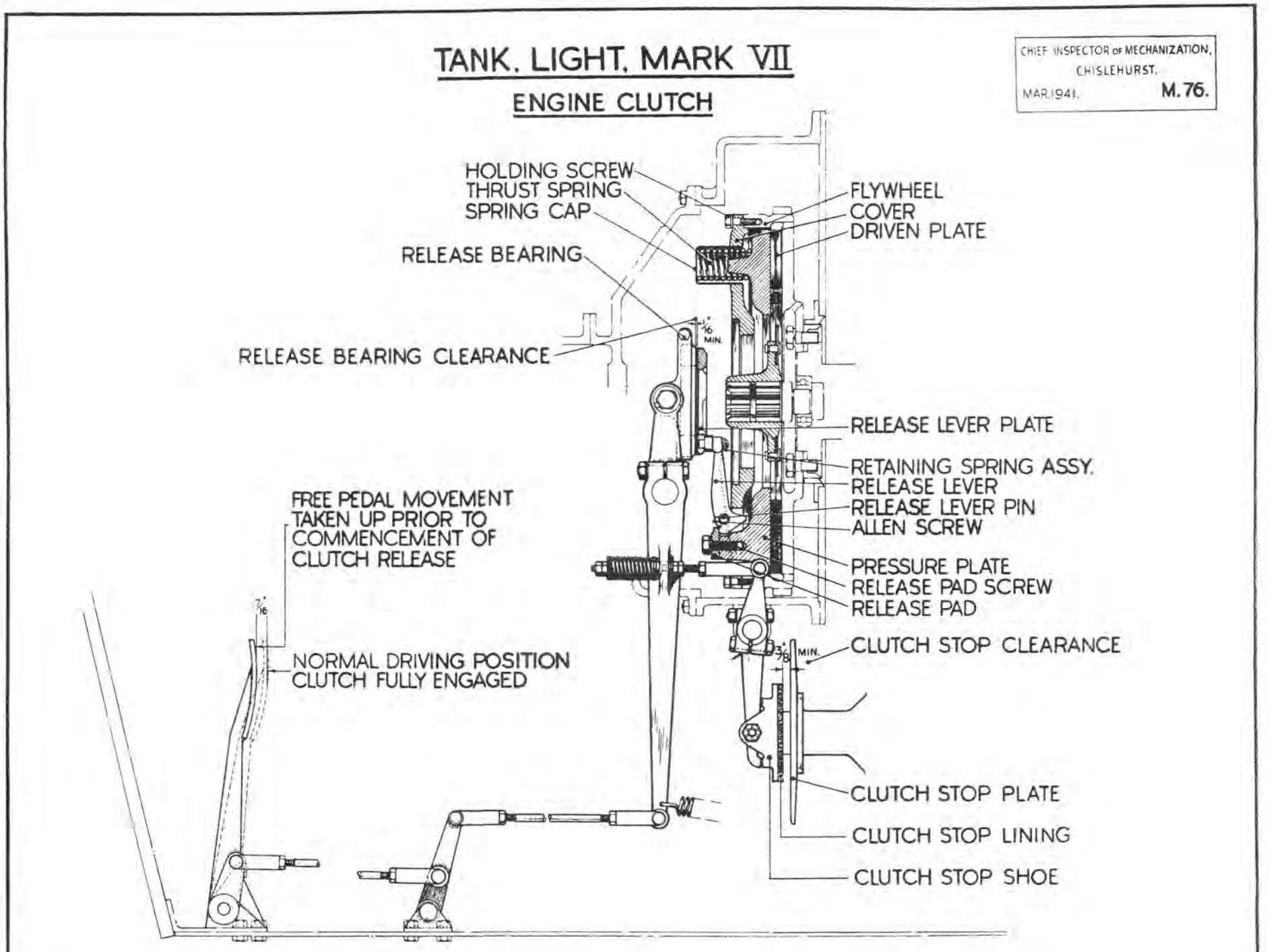
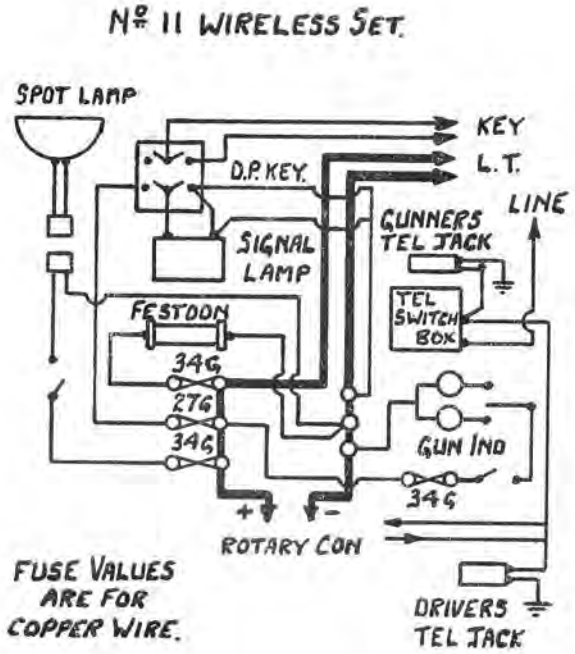


PLATE No. 9.

ELECTRICAL WIRING DIAGRAM—TURRET.



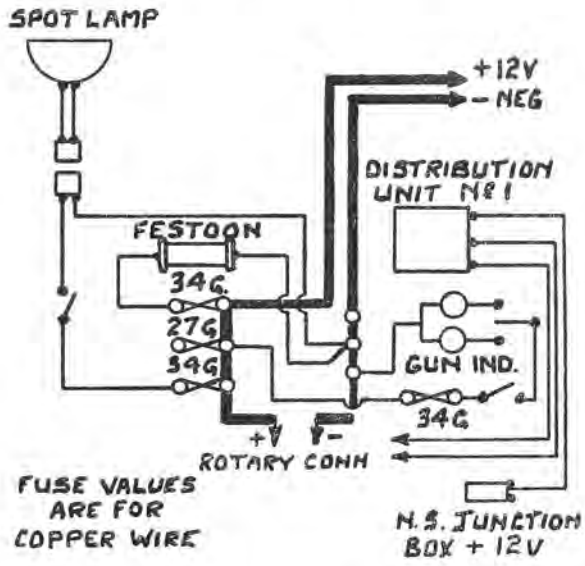


Plate No. 9

ELECTRICAL WIRING DIAGRAM—TURRET