

**WORKING
AND
MAINTENANCE
INSTRUCTIONS
FOR**

Ransomes

**MOTOR CULTIVATOR
M.G. 5**

Ransomes, Sims & Jefferies, Ltd.
ORWELL WORKS
IPSWICH, ENGLAND.

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**GENERAL DESCRIPTION
AND
SPECIFICATION**

GENERAL DESCRIPTION

ENGINE.

A specially designed single cylinder air-cooled engine unit is fitted, incorporating an automatic clutch and a petrol pump.

Specification :

Bore : 3.420" (86.84 mm.)	Lubrication : dry sump, pressure fed.
Stroke : 101 mm.	Clutch : automatic centrifugal.
Capacity : 600 c.c.	Fuel : petrol, pump fed.
Cycle : 4-stroke.	Capacity of Fuel Tank : 2½ gall.
Cooling : Air—by impeller fan.	Ignition : Impulse starting magneto.

The engine is a self-contained interchangeable unit which can be taken out by removing four bolts and four coupling stud nuts—disconnecting the throttle cable, exhaust pipe, petrol pipe, H.T. lead, and bumper bar.

TRANSMISSION.

The power is transmitted from the engine crankshaft through an automatic centrifugal clutch (which comes into operation at approximately 600 r.p.m.) to a flexible rubber coupling which connects the engine unit to a 4-r reduction gear box spigoted into the front of the main gear box plate. The slow speed shaft of the reduction gear carries the spiral bevel pinion drive to the main gear box containing forward, reverse and differential gear. A final spur gear reduction is incorporated in casings on the outside of each side of the main frame. The rearmost track wheels are idler wheels which support the patented rubber-jointed tracks only.

STARTING.

Starting is by means of a starting handle on the crankshaft at the front of the engine.

POWER TAKE-OFF.

Provision is made for the fitting of a special extension unit to convey power to the rear of the main frame. The power take-off is controlled by a separate dog clutch situated just at the rear of the main gear box back plate and has a speed of 700 r.p.m.

CONTROL.

There are only three main controls, namely :—

- (1) The throttle which controls engine speed and, automatically, the engaging and disengaging of the clutch.
- (2) The two brake levers by which steering is accomplished.
- (3) The gear lever.

DRAWBAR.

Two drawbars are provided: one swinging horizontally for the attachment of independent implements, and the other floating vertically for the direct attachment of a tool bar frame. This latter drawbar is pivoted at the point of balance of the machine—a special feature that enables the tool bar frame always to be worked in a level position irrespective of the movement of the machine itself.

LIFTING GEAR.

The floating drawbar is provided with a hand lifting lever mounted on the machine which enables the driver to lift or lower the tool bar frame quickly and easily.

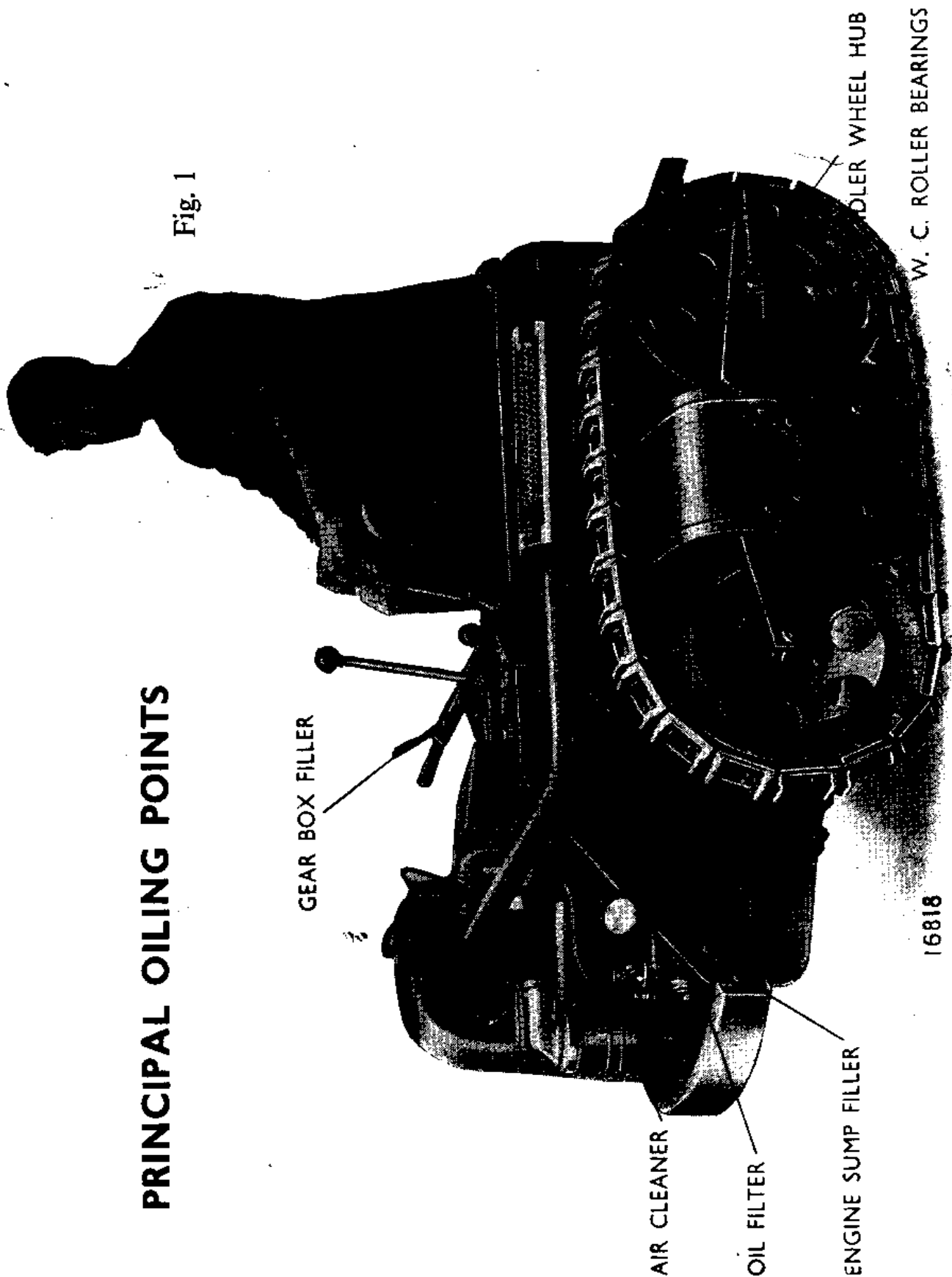
WORKING SPEED.

The M.G.5 is designed to do "2-horse work at horse speed." Do not therefore attempt to do more than a 2-horse job at $2\frac{1}{4}$ m.p.h. It can do classes of work that no other machine or horse can do. It does not pretend to compete with large tractors or to do heavy or fast work. Excessive speed or overloading will only cause excessive wear and a short, expensive life.

LUBRICATION

PRINCIPAL OILING POINTS

Fig. 1



LUBRICATION

The satisfactory working of the M.G.5 depends, as in the case of all machinery, upon correct and adequate lubrication. Too much stress cannot be laid upon this. If the maximum trouble-free life is to be obtained, lubrication must be attended to regularly and conscientiously. It is in the customer's own interests, therefore, to study and carry out the following instructions.

LUBRICATION CHART.

Part.	Frequency of Lubrication.	Lubricant recommended.
Engine sump.	Check level before commencing work. Change oil and clean filter every 100 hours.	Triple Shell Mobiloil BB Castrol XXL Motorine B de Luxe Essolube 50 Shell tractor oil (Heavy) SAE. 50
Main gear box and reduction gear box	As necessary according to dipstick	
Final drive gears.	Check level. Change oil every 500 hours.	Shell Tractor Gear Oil SAE 140 or Shell Spirax C Mobiloil C Esso Gear Oil Heavy Castrol D Motorine Battersea A Do not use grease
Wheel hubs.	Daily.	
Weight carrying rollers.	Every five hours.	
Pin joints, etc.	Daily.	Engine oil.
Magneto	Every 200 hours.	
Air Cleaner.	Check level daily. Change oil every 100 hours. (See instructions on page 18).	Shell Tractor Oil Light or Single Shell Mobiloil A Essolube 30 Motorine M Castrolite

ENGINE SUMP.

The engine has two pumps—one forcing oil into the engine and the other sucking it out and returning it through the oil filter, which is built into the crankcase immediately beneath the oil filter tube. A few minutes after starting the engine a flow of oil should be seen coming into the oil tank at the base of the oil filter tube. Under no circumstances should the engine be run unless the flow of return oil is apparent. Should no oil appear after making sure that there is ample oil in the sump, the oil filter should be removed to make sure that it is not choked. (See under "Oil Filter"). If the filter is clear and yet oil does not circulate, call in your Service Agent.

The oil in the sump should be kept at a high level and never be allowed to get below three-quarters full. The sump should be drained and refilled with fresh oil after every 100 hours work. Sump capacity is $\frac{1}{2}$ gallon. (See Fig. 1).

MAIN GEAR BOX AND REDUCTION GEAR BOX.

This gear box holds approximately 5 pints of oil and the level should be maintained in accordance with the dipstick provided, which can be inserted through the gear box oil filler orifice (See Fig. 1). Under no circumstances should the oil level be brought above the maximum shown on the dipstick, as otherwise oil may escape along the shafts to the steering brakes and cause slipping. The reduction gear box is automatically lubricated from the main gear box.

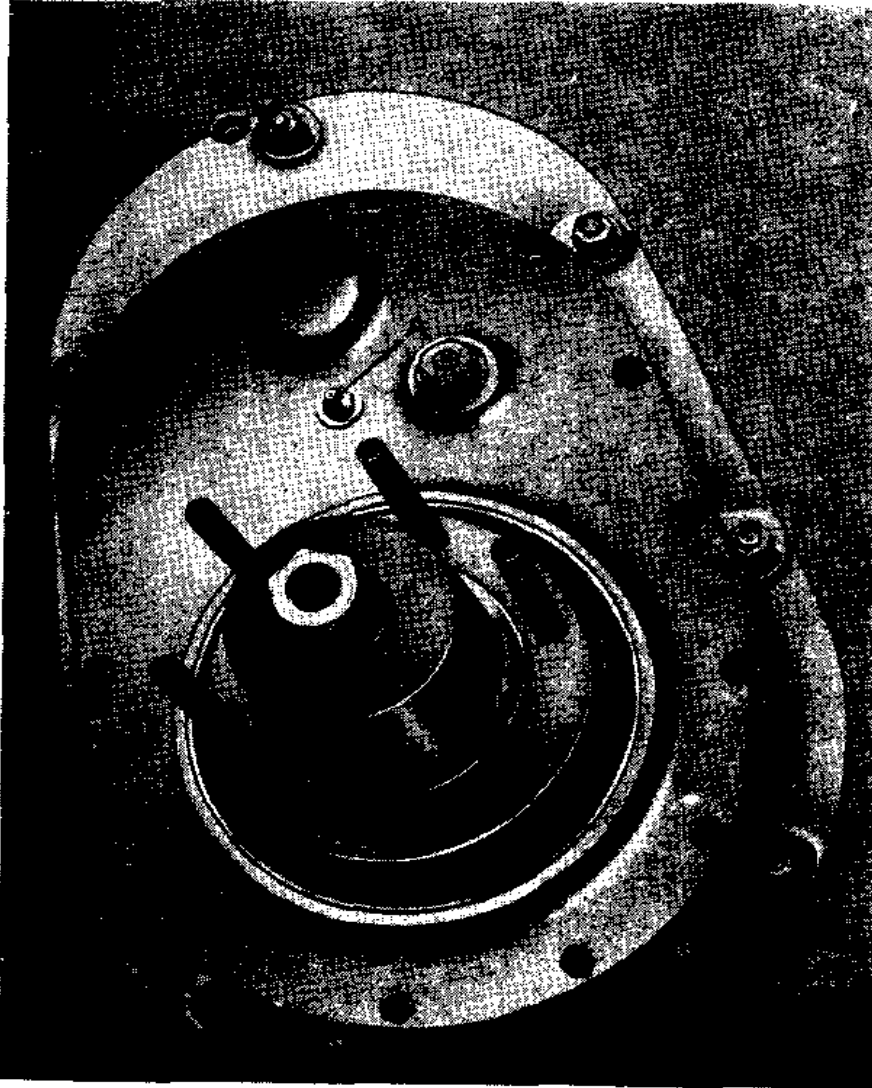


Fig. 2

FINAL DRIVE GEAR CASES. (See Fig. 2).

Each of these two cases is provided with two plugs on its under side, marked 'B' and 'C' on Fig. 2.

The top one, marked 'B', is a high level plug, and the oil should always be maintained just up to this level.

The lower plug, 'C', is a drain plug for emptying the case.

The case should be filled, or the oil level adjusted, by means of the nipple 'A'. Before doing this, be sure to remove the oil level plug 'B'. Under no circumstances should the oil level be higher or lower than plug 'B'.

As oil may also enter the gear cases from the driving wheel hub, it is important that the level should be checked after at least every 50 hours of work. This is done by removing oil level plug 'B', and if no oil flows out, filling up to correct level by means of nipple 'A'. Too much oil may result in leakage to the steering brakes and cause steering difficulties.

These cases should be drained after every 500 hours of work and replenished with fresh oil.

IDLER WHEEL HUBS.

Lubricate every day by means of the oil gun nipples provided (see Fig. 1). Five or six pushes with the oil gun are sufficient.

WEIGHT CARRYING ROLLERS.

Lubricate every five hours by means of the oil gun nipples provided. To ensure adequate lubrication of the special seals fitted to these rollers, it is necessary to continue pumping in the oil until it begins to leak away on both sides of the spindles. (Fig. 1).

PIN JOINTS, LEVER FULCRUMS, Etc.

There are a few pin joints, lever fulcrums, etc. on the M.G. 5 which should receive a small quantity of oil regularly to ensure correct working and prevent undue wear. This also applies to the slots for the floating drawbar in the rear chassis plate.

DRIVING SPROCKET WHEEL ROLLERS.

Under no circumstances should these be oiled. They should be run perfectly dry. It is most important to see that these rollers are always free to revolve. Should for any reason a roller become tight, it must be freed by gently tapping it with a hammer.

VERY IMPORTANT NOTE

QUALITY OF LUBRICATING OIL.

Attention is drawn to the extreme importance of using only a high grade oil in the engine if satisfactory working and reasonable life are to be assured.

With lubricating oils, as with most other things, the purchaser gets just the quality that he pays for. To the uninitiated, two oils, one a cheap one and the other a known brand of high grade oil, may, in the cold state, appear to be similar, yet, at the high working temperature in the cylinder of a petrol engine, the actual lubricating qualities will be vastly different, with the result that, owing to the poor lubricating qualities of the cheap oil, excessive wear of cylinder bore, piston and piston rings takes place from the beginning.

This may not, for a time, be noticeable in the working of the engine, but abnormal wear is going on, and in due course, a stage is reached when there is serious loss of compression with accompanying loss of power, unsatisfactory running and heavy petrol and oil consumption. Costly repairs are then inevitable.

It will be seen, therefore, that in the end, it is a very expensive business to use cheap oil.

Moreover, it should be understood that Ransomes, Sims and Jefferies, Ltd. cannot hold themselves responsible for any unsatisfactory running or damage resulting from the use of an oil of a different brand and quality from those oils which they recommend.

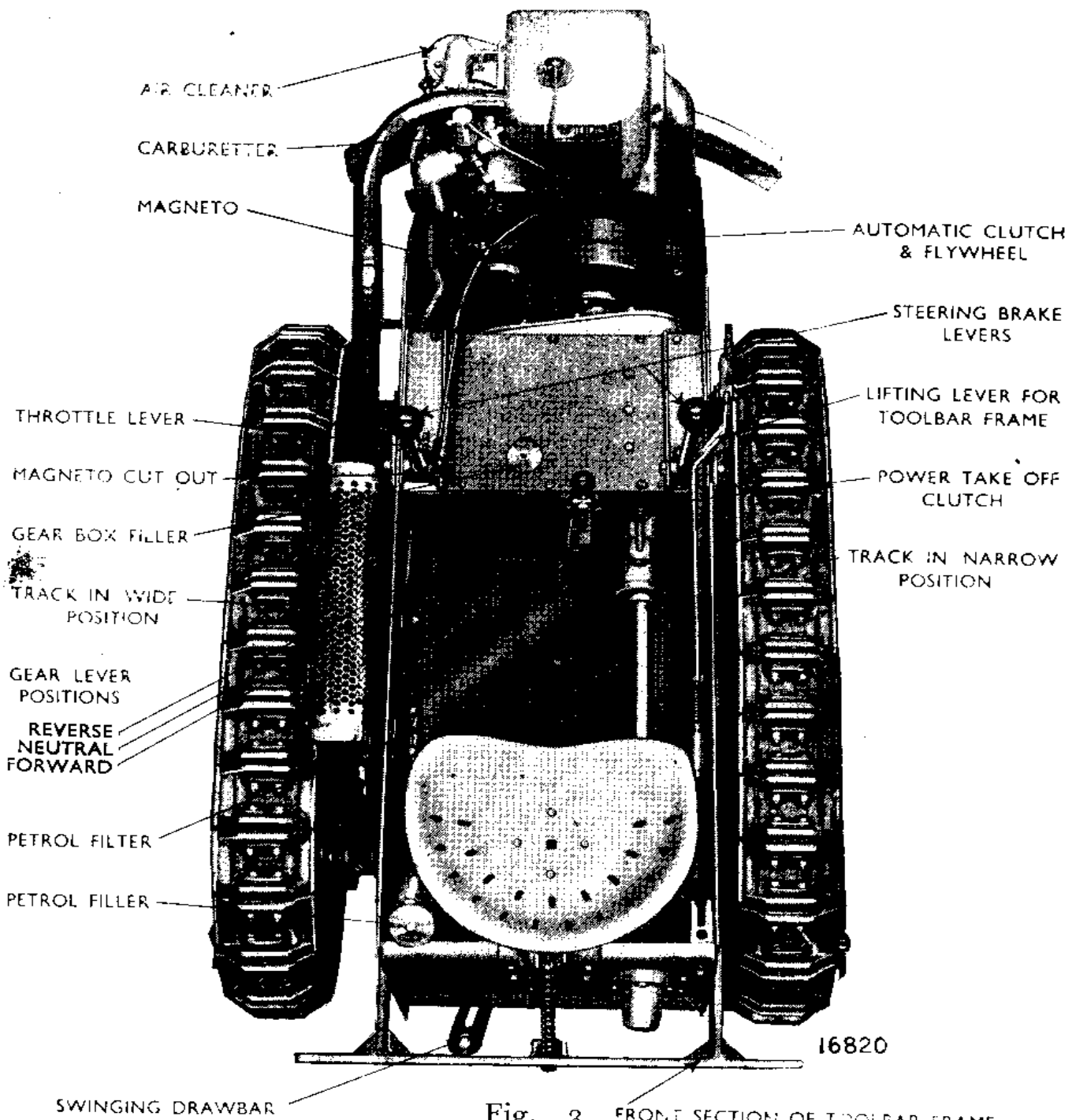


Fig. 3 FRONT SECTION OF TOOLBAR FRAME

**STARTING UP A
NEW MACHINE**

STARTING UP A NEW MACHINE

The following instructions should be carefully followed when starting up a new machine.

LUBRICATION.

Check over the lubrication of the machine and see that sump and gear cases are filled to their correct levels.

Do this in conjunction with the detailed lubrication instructions given on pages 11 to 14.

FUEL.

Fill the fuel tank, which is under the driver's seat, with petrol. The use of an upper cylinder lubricant or Duckham's Adcoids is recommended.

GEAR BOX.

See that the gear lever is in the central or neutral position.

AIR CLEANER.

Make sure that the cleaner is filled with the correct grade of oil up to the oil level mark.

(See Lubrication Chart, page 11 and Fig 5 for oil level).

BRAKE LEVERS.

See that these are correctly adjusted (See page 25).

TO START ENGINE (Fig 4).

- (a) Flood carburettor by hand priming the pump and depressing tickler knob. Push down strangler knob and turn to lock it down. This is not necessary when engine is warm.
- (b) Set throttle lever on left hand steering lever so that it is open about $\frac{1}{16}$ ". According to atmospheric conditions, it may be necessary to open the throttle slightly.
- (c) Insert starting handle in the claw and pull the engine over two or three times to suck petrol into the cylinder.
The sharp clicking noise that will be heard is the impulse starting mechanism of the magneto.
Then bring the engine up against compression, release strangler knob and hold about half open and give a sharp pull up, when the engine should start.
The ignition is automatically advanced as the engine speed is increased.
- (d) When the engine is started, lift strangler by turning the knob till released, and regulate the throttle to give a steady slow engine speed.
- (e) See that lubricating oil in engine is circulating as described on page 11.
- (f) Warm up engine well before moving off, but do not race it.

TO MOVE OFF.

The driver can now take his place on the seat. To move off :

- (a) Close throttle so that engine is ticking over.
- (b) Move gear lever to the right or forward position. **Never** attempt to move lever unless engine **is** ticking over.
- (c) Gradually open throttle, when the engine will increase speed and the automatic clutch gradually engage.
Continue to open throttle until desired speed is attained, but never race the engine.
- (d) To steer, pull right hand lever to turn right or left hand lever to turn left, by a series of sharp but gentle jerks. Do not hold on to steering levers and cause continuous braking.
- (e) To stop machine close throttle and, if necessary, apply both steering brakes firmly.
- (f) Reversing is carried out in the same manner as forward motion, except that the gear lever must be placed in the reverse position.
- (g) To stop engine, press magneto cut out switch at the bottom of left hand steering lever.

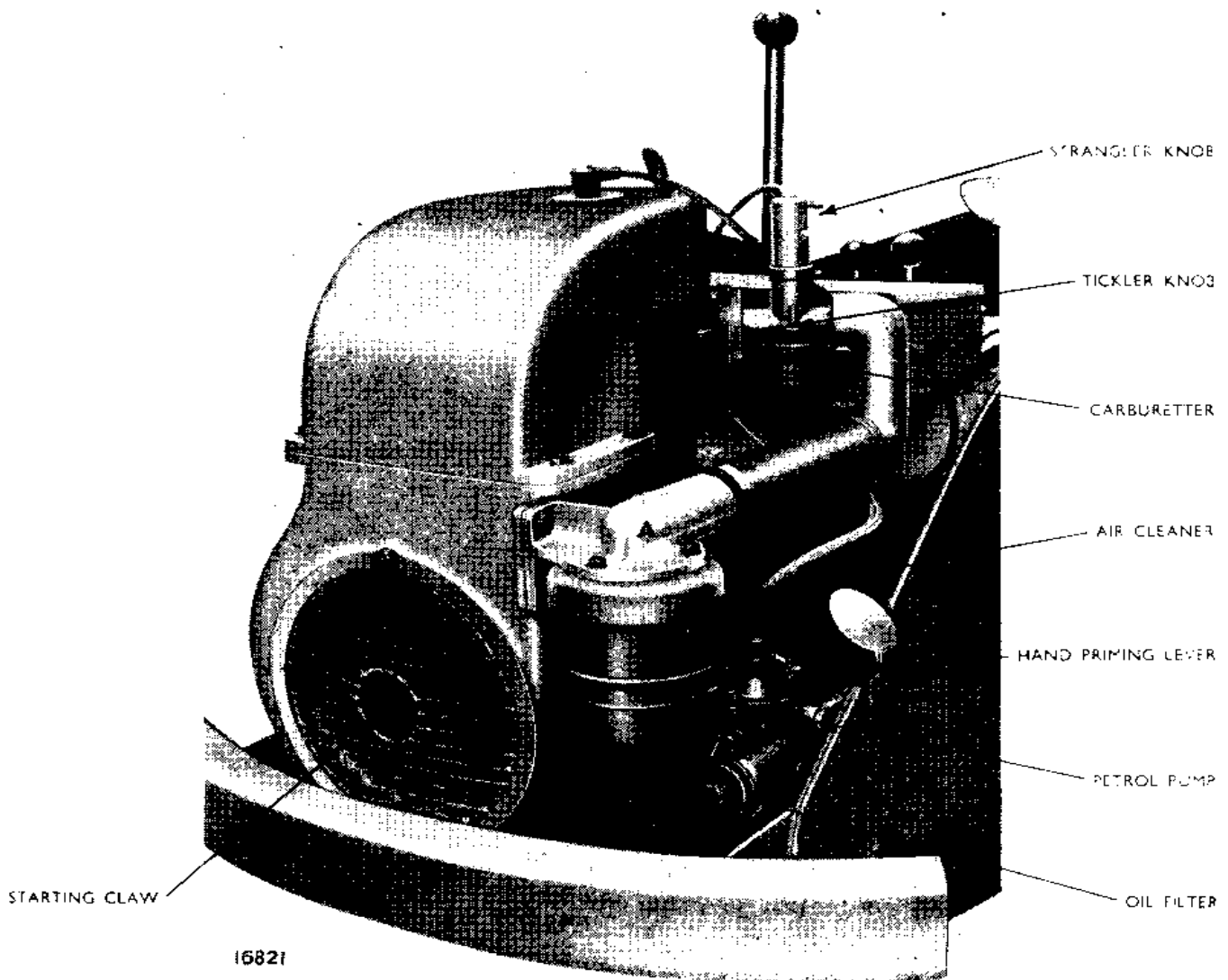


Fig 4

AFTER A FEW HOURS WORK.

A new machine requires "running in" and the first two or three days' work should be of a light nature.

After this : --

- (a) Check tappet clearances (*see page 38*).
- (b) Check steering brake lever adjustments (*see page 25*).
- (c) Tighten all nuts, particularly those on wheel hubs.

**THE MACHINE
IN WORK**

THE MACHINE IN WORK

The following additional instructions are given as a guide to the operator in his daily use of the M.G.5.

They should be studied carefully so that the best results may be obtained from the machine.

STARTING UP.

- (a) **Lubrication.** Always check over the lubrication of the machine before starting the day's work. Carry out the instructions given on lubrication on pages 11 to 14. Make sure the engine oil is circulating correctly and a flow of oil appears at the base of the sump filler tube.
- (b) **Magneto.** Study the instructions given on page 18 under "Starting up a New Machine." Never run the engine so slowly that the impulse mechanism can be heard clicking. The ignition is automatically advanced as the throttle is opened.
- (c) **Carburettor.** Never run with the carburettor "strangled". Do not flood it unnecessarily.

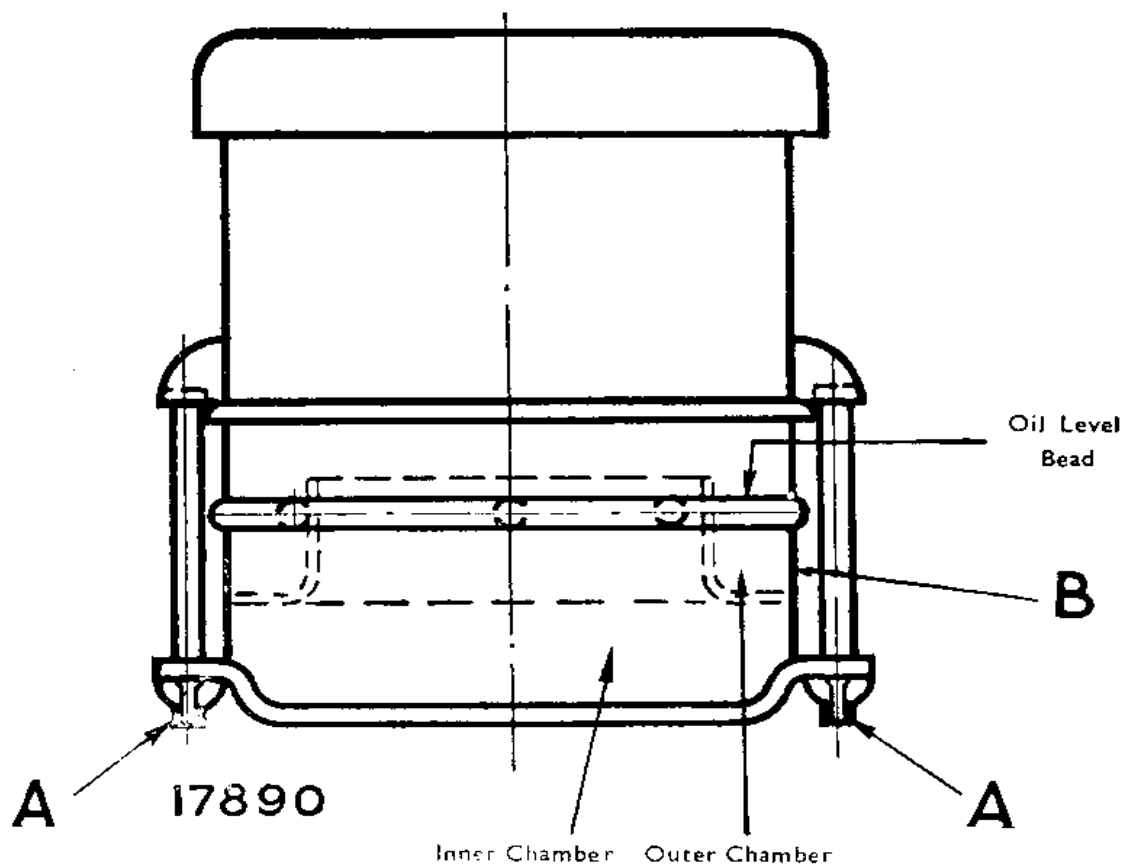


Fig. 5

AIR CLEANER.

The life of the engine depends to a very large extent on the satisfactory functioning of the air cleaner. **Give it careful attention and adhere rigidly to these instructions.**

Faulty air cleaning can cause an engine to be ruined in 50 hours or less.

- (a) **Examine oil cup daily.** See Fig. 5.

To do this slacken the two wing nuts "A" at the base and remove the oil cup "B". See that the oil is level with the oil level bead. If there is a layer of dirt in the bottom of the cup, empty, wash out with petrol and refill both inner and outer chambers of cup to oil level bead with one of the grades as shown in the Lubrication Chart on page 11.

Note. Oil that will not flow freely is useless. Do not use the grade recommended for the engine : it is too heavy.

- (b) Wash the screens in the main body of the cleaner regularly.

To do this, remove the oil cup "B", then remove the cleaner body complete by unscrewing either of the two clips on the flexible hose that connects it to the carburettor, and unbolting the cleaner bracket from the fan cowl. Do not under any circumstances separate the top casting "A" (Fig. 4) from the body of the air cleaner, as it is absolutely essential that the joint at this point should be perfectly air tight. The screens can now be washed by pouring some petrol into the pipe, shaking and emptying out. Re-assemble, fill up with oil to the oil level mark and replace. Care should also be taken to see that dirt does not clog up the air inlet holes, just under the top rim of the cleaner, otherwise sufficient air will not reach the engine, and faulty running will occur.

PETROL FILTER.

The machine is fitted with a "Zenith" petrol filter for the express purpose of ensuring that no dirt enters the engine with the petrol.

- (a) **Clean out the glass bowl** as often as is necessary according to the amount of accumulated dirt in it.

To remove the bowl for cleaning, loosen the hand screw at bottom of stirrup, and swing this aside, when bowl can be removed.

Note. Care should be taken when replacing bowl to see that it seats properly on the cork joint and that this is not damaged. It is **not** necessary to use undue pressure on the stirrup screw to ensure a petrol tight joint.

SPECIAL NOTE—If for any reason the filter is removed from the frame, make absolutely certain when replacing that it is connected up so that the petrol flows through in the right direction as indicated by arrows on the filter.

OIL FILTER

The oil filter is of the built-in type and is screwed into the crankcase on the front left side just below the oil filler tube. It can be removed by unscrewing the nut shown in Figs. 1 and 4. Clean by rinsing in petrol.

When replacing, make sure the cork washer is in good condition.

AUTOMATIC CLUTCH.

Do not work with the clutch on the point of slipping : ease the load on the machine.

FINAL DRIVE GEARS.

Do not on any account neglect the lubrication of these gears which are in the cases between the chassis and the tracks. Carefully carry out the instructions on page 12.

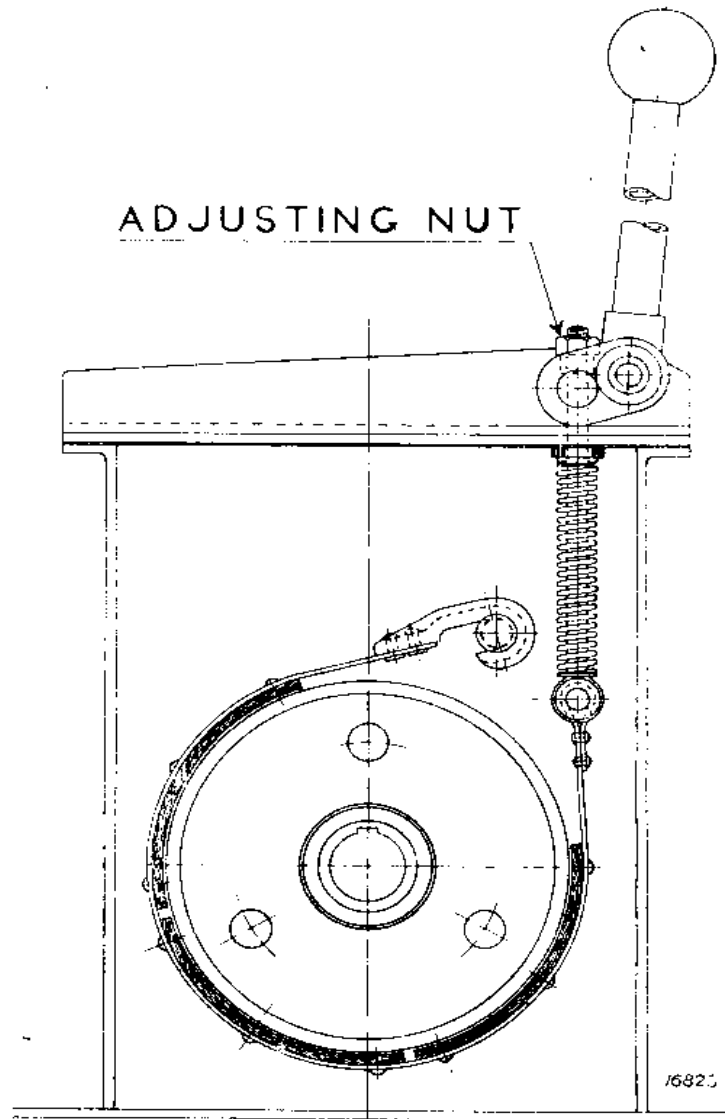


Fig. 6

STEERING BRAKES.

Keep these properly adjusted. The brake bands are adjusted by the hexagon nuts in front of the bases of the levers. There should be an appreciable movement of the levers before the bands begin to hold, and the brakes should be entirely free when the levers are released. Care should be taken to ensure that both levers have the same amount of movement, in order to facilitate accurate steering. (*See Fig. 6*).

TRACKS.

Keep these properly tensioned. (*See pages 40 to 41*).

DRIVING SPROCKET WHEEL ROLLERS.

Inspect these every day to see that they are perfectly free. Never lubricate, but, if tight, tap to free them.

WEIGHT CARRYING ROLLERS.

It is essential that the bearings of these should be frequently and generously lubricated, as not only do they carry practically the whole weight of the machine, but they are also revolving almost continuously in dirt. They are fitted with special "Orolo" oil seals, the lips of which face outwards from the bearings. Oil is pumped into the rollers until it bursts through the seals, and in doing so, pushes away any dirt that has accumulated on them. Do not work with badly worn bearings or with roller rims worn down to less than $7\frac{1}{2}$ " dia. as otherwise serious wear will occur on the rest of the track mechanism, and, in addition, the efficiency of the whole machine (drawbar pull, adhesion, etc.) will suffer considerably.

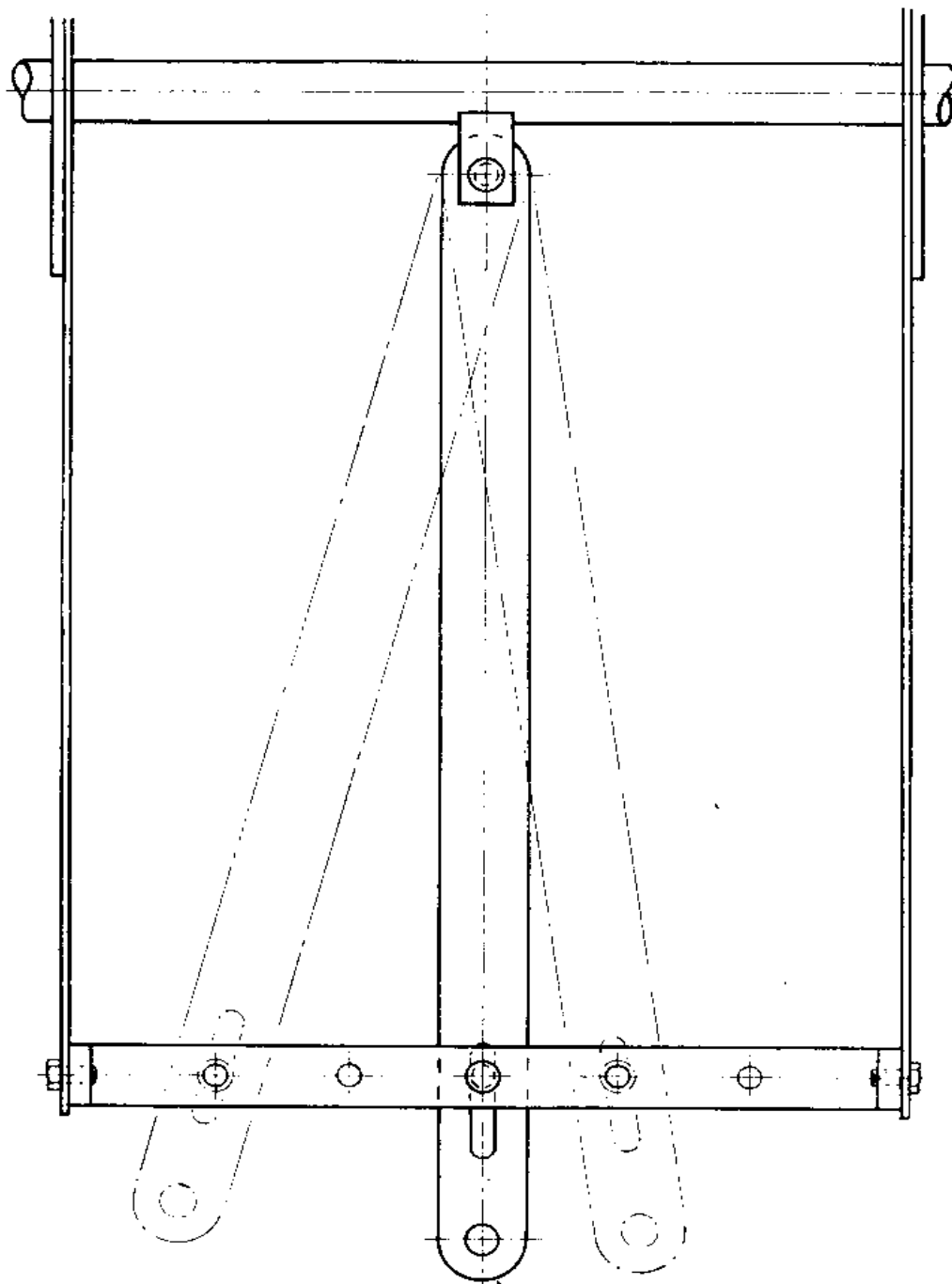
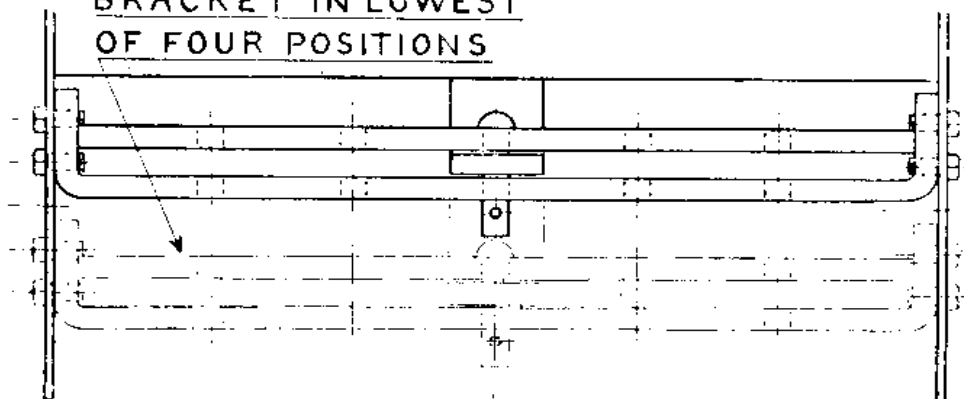


Fig. 7

DRAWBAR CAN BE FIXED
IN ANY ONE OF FIVE
POSITIONS OR ALLOWED
TO FLOAT

DOTTED LINES SHOW
BRACKET IN LOWEST
OF FOUR POSITIONS



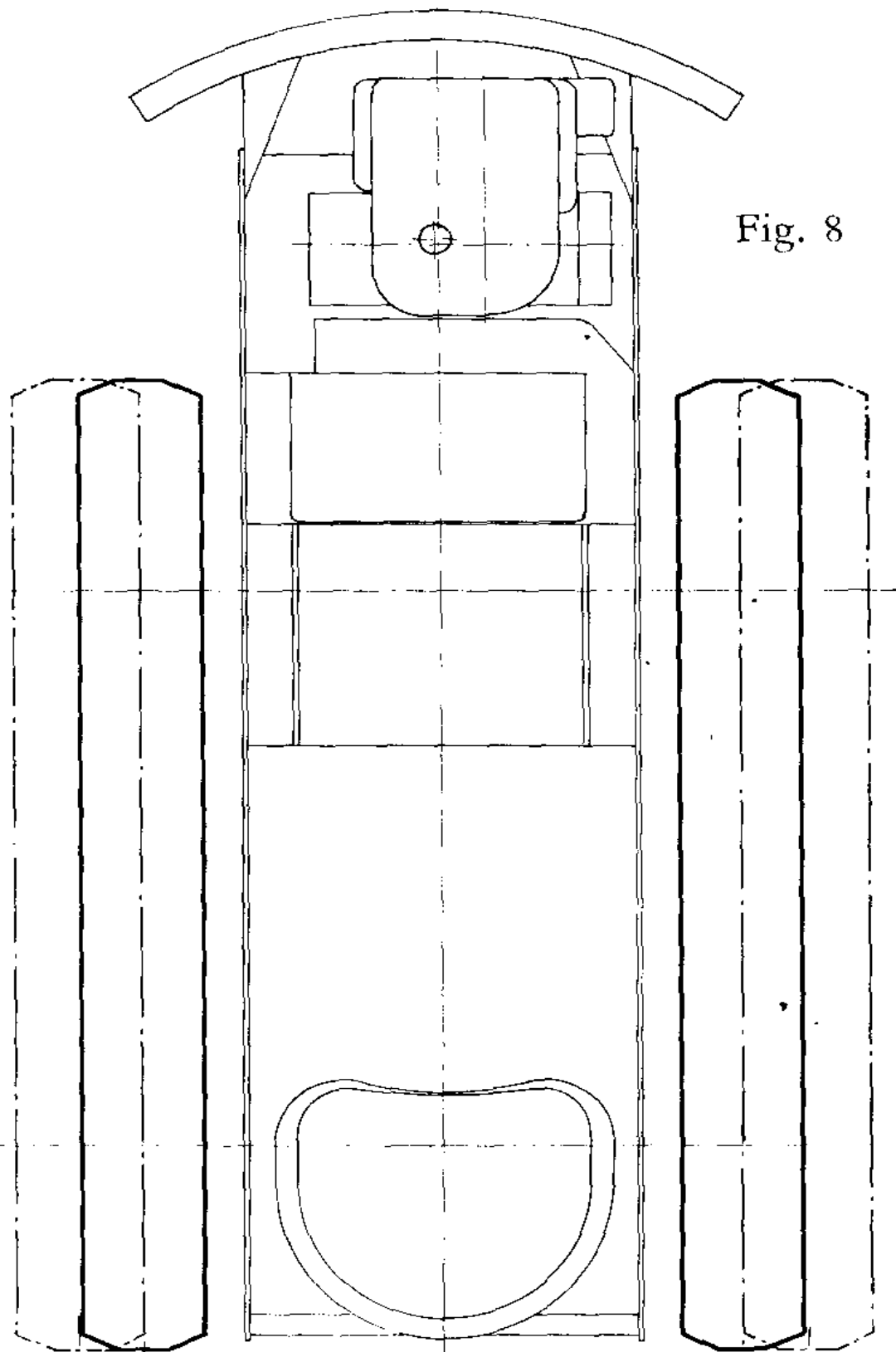


Fig. 8

BOTH TRACKS IN NARROW POSITION
 2' - 4 1/2" CRS.

BOTH TRACKS IN WIDE POSITION
 2' - 10 3/4" CRS.

ONE TRACK IN & ONE OUT
 2' - 7 5/8" CRS.

SWINGING DRAWBAR HITCH.

Whenever possible, adjust the draught on the implement being drawn so that the drawbar can swing freely. This reduces side draught and facilitates steering considerably.

The drawbar quadrant can be adjusted to any one of four positions to assist the free movement of the drawbar (*See Fig. 7*).

TRACK WIDTH ADJUSTMENT.

The tracks can be set in any one of three positions :—

Setting of tracks.	Distance between track centres	Width between tracks	Overall width of tracks	Overall width of machine
Both tracks in narrow position	28½"	22½"	34½"	37½"
One track wide and one narrow	31½"	25½"	37½"	40½"
Both tracks in wide position	34½"	28½"	40½"	43½"

With these settings all widths of row crop work can be dealt with, from 12" to 36" planting (*See Fig. 8*).

ALTERING TRACK WIDTH.

The M.G.5 is supplied as standard with both tracks narrow and to set either track to the wide position a special distance bracket with extra bolts and 2 special axle extensions are required.

To set a track in the wide position proceed as follows :—

- (a) Jack up one side of the machine. (This can be done by a jack under the gearbox or by a lever and wood packing).
- (b) Slacken track tension and remove track by levering off idler wheel.
- (c) Remove weight carrying rollers by withdrawing centre bolts (H).
- (d) Remove roller frame by taking out the 2 long bolts (C) securing frame to chassis and removing nuts (A) from driving and idler wheel axles, when complete frame member can be withdrawn.
- (e) Remove 6 nuts (D) securing driving and idler wheels to hubs, reverse wheels and replace nuts.
- (f) Screw on to driving and idler wheel axles the special extensions (E) supplied when specially ordered.
- (g) Bolt to chassis the special distance bracket supplied when specially ordered, with bolts provided (G).
- (h) Replace roller frame member, bolt to distance bracket (F) with bolts (G) supplied with bracket.
- (j) Replace weight carrying rollers and track. Tension correctly as on page 40. (*See Fig. 9*).

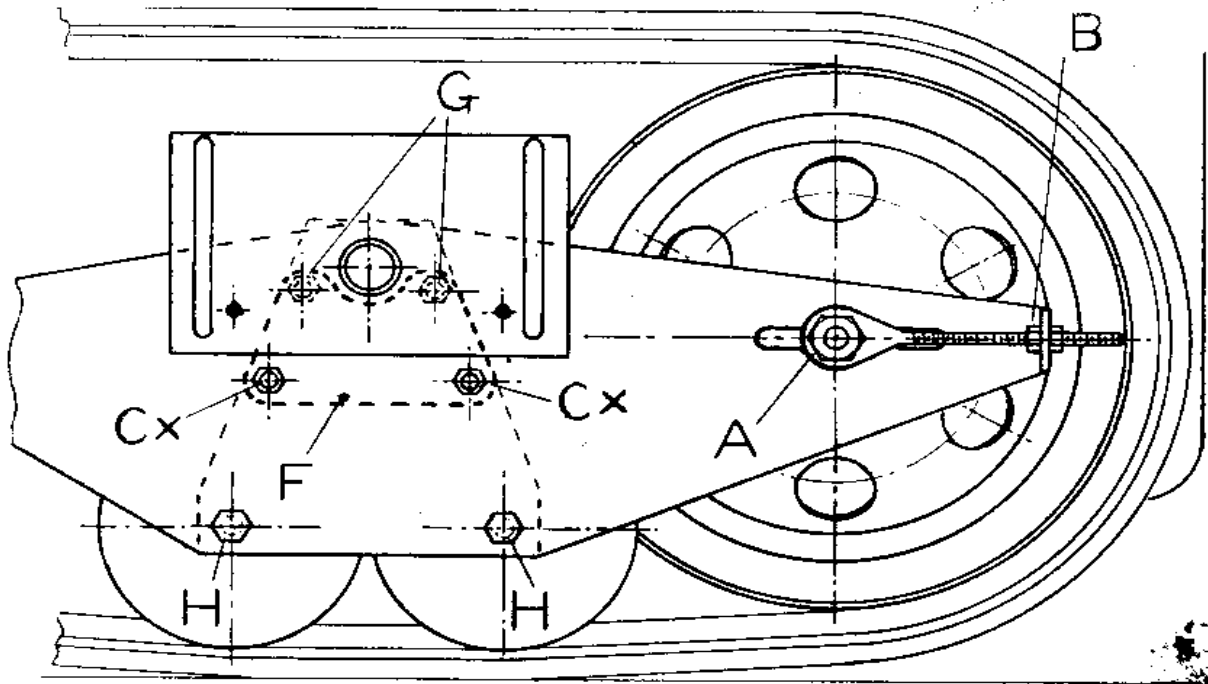
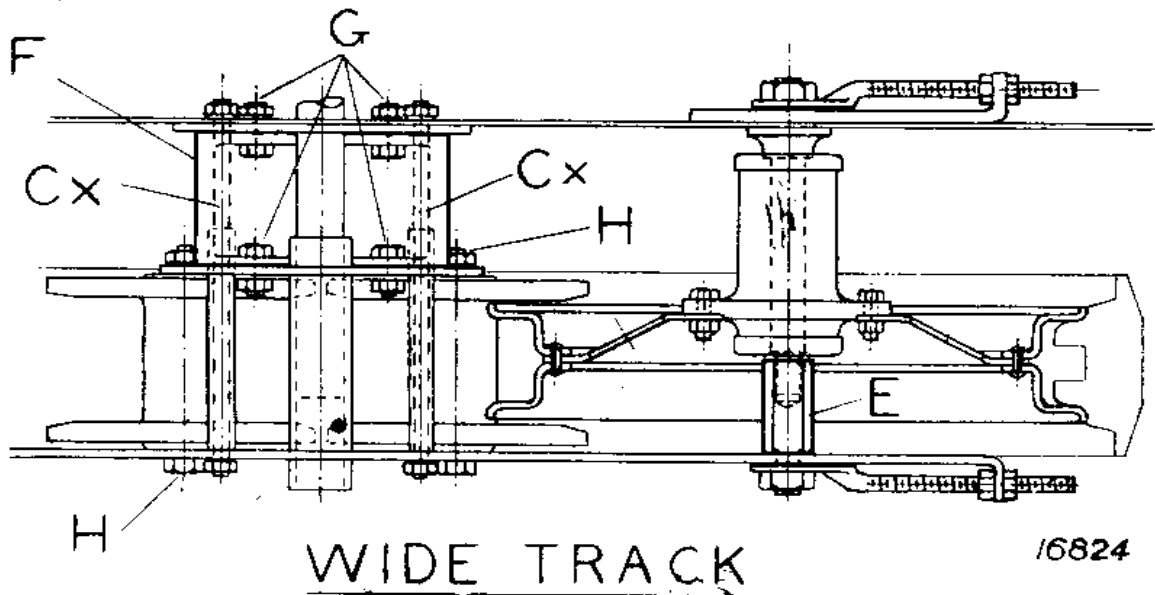
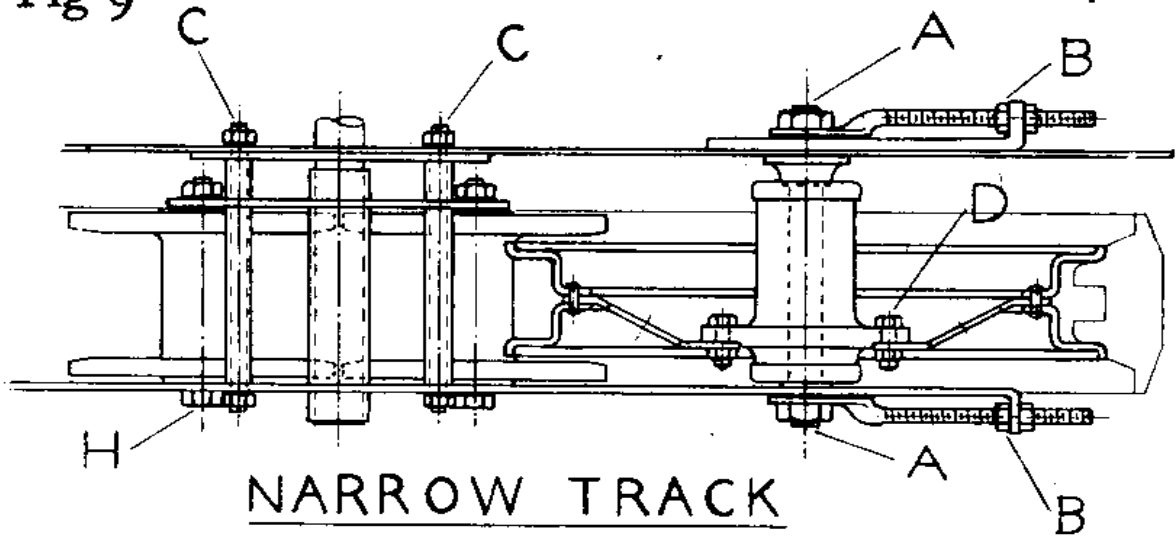


Fig 9



TRACK WIDTH WHEN PLOUGHING.

When ploughing, the drawbar should be free to swing laterally so that the tractor can be steered without steering the plough. The drawbar need only be pinned in position when opening or closing a furrow.

Whenever ploughing conditions permit, plough with the tracks in the narrowest position, or, at any rate, with the right hand track at its narrowest. This will materially help to avoid side draught and make the steering easier.

Run the track as near the edge of the furrow as possible and adjust the plough to suit.

Remember that a track machine should not be run with a track in the bottom of a furrow except when "finishing off", in which case it may be unavoidable.

Protection plates are provided for bolting to the floating drawbar to prevent the plough drawbar catching in the cleats of the tracks when turning on the headlands.

TRAILER WORK.

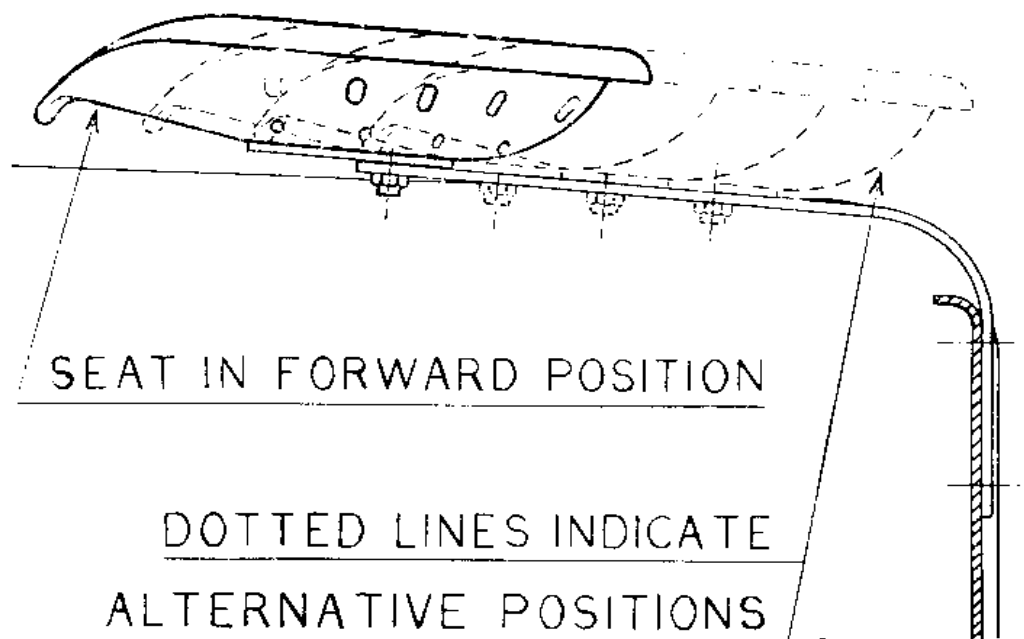
If the machine is used to draw a trailer attached to the swinging drawbar, fix this to prevent it from swinging. The drawbar attachment point on the trailer should be at the same height as the swinging drawbar on the machine.

This is most important.

BELT WORK.

Provision is made for the attachment of a power take-off shaft which incorporates an engaging clutch. This shaft runs at 700 r.p.m. with an engine speed of 2,000 r.p.m. and can be used either with the tractor stationary or moving.

The pulley end of this shaft is splined and special splined pulleys to suit, from 5" to 10" dia. can be supplied.



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Fig. 10

BALANCE.

The adhesion of the tracks is always greatest when the machine is level or parallel with the ground. Heavy loading tends to lift the front of the machine and this should be counterbalanced by :—

- (a) Keeping hitch point as low as possible.
- (b) Adjusting operator's weight by moving seat forward into forward holes on the seat brackets (see Fig. 10).
- (c) Operating implements so that they come within the scope of the power available. Where ground conditions are not favourable, greater care should be taken in balancing the machine.

BOLTS, SCREWS AND NUTS.

With almost all machinery there is a certain amount of vibration, and this may cause bolts, screws and nuts to work loose. It is therefore a wise thing to tighten these periodically. Regular attention to small details such as this will be amply repaid in freedom from accidents and breakages, and in a longer working life of the machine.

**MAINTENANCE
INSTRUCTIONS
FOR USERS**

MAINTENANCE INSTRUCTIONS TO USERS

LUBRICATION.

Separate detailed instructions are given on pages 11 to 14.

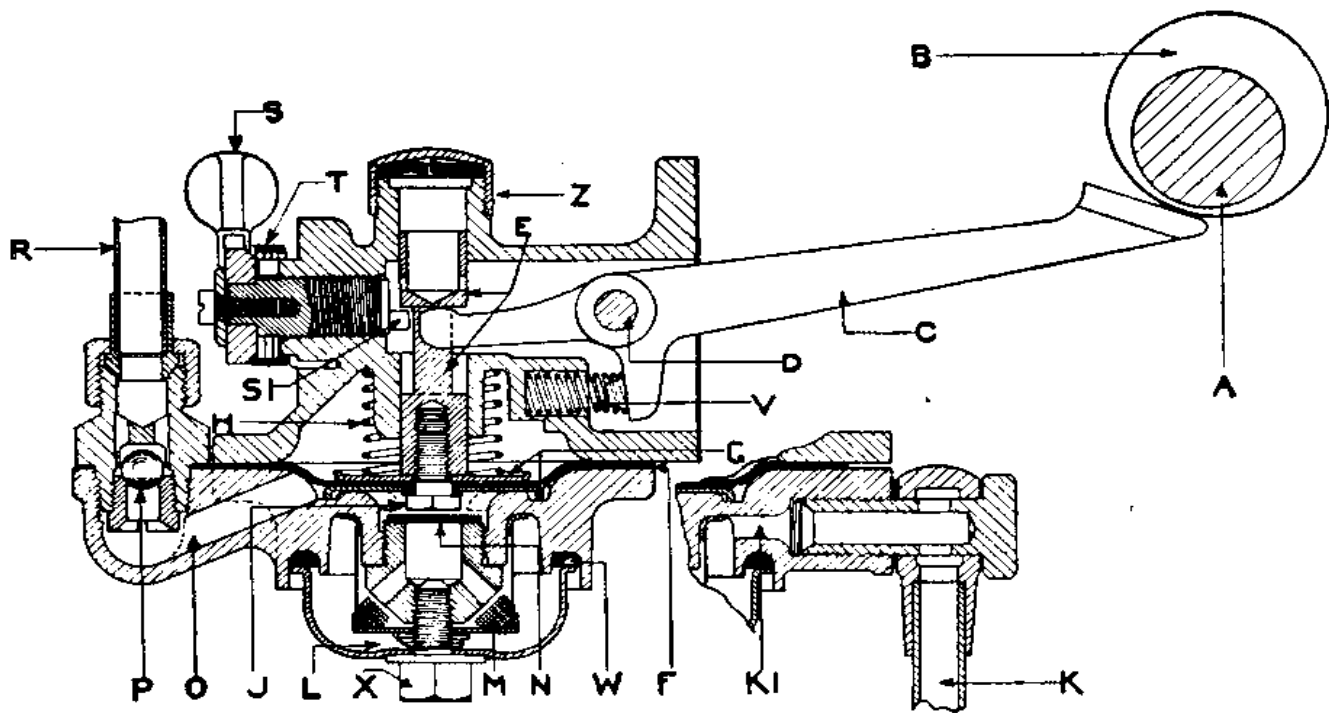


Fig. 11

PETROL PUMP.

The petrol pump (*See Fig. 11*) is mounted on the side of the crankcase and is operated by an eccentric from the camshaft.

A filter "M" is incorporated in the pump.

A hand primer "S" is fitted, a few strokes of which will fill the float chamber of the carburettor.

FOR GENERAL CLEANING.

Do not separate the two halves of the pump by removing the five screws unless it is necessary, even if it may be desirable to detach the whole pump from the engine for cleaning or inspection.

The inlet pipe connection "K", the sump "L", the filter sump "M", the suction valve "N", and the delivery valve "P" are easily taken apart and can be flushed out with petrol.

If it is desired to inspect or remove the suction valve "N" this can be done by removing first the filter bowl "L" and after that the strainer

" M " with spring support. Then unscrew the suction valve seating, when the disc type suction valve drops away. The only thing to be looked for in this connection is dirt, there being no springs of any description in this valve.

After replacing the parts see that the filter bowl " L " seats properly on the washer " W " in the recess and that the bowl is tightened up firmly by the screw " X ".

To inspect the delivery valve " P " the delivery connection should be unscrewed from the lower half of the pump, and the bush with screw-driver slot unscrewed from the underside when the ball valve will fall away. Again nothing need be looked for in this valve but an accumulation of impurities.

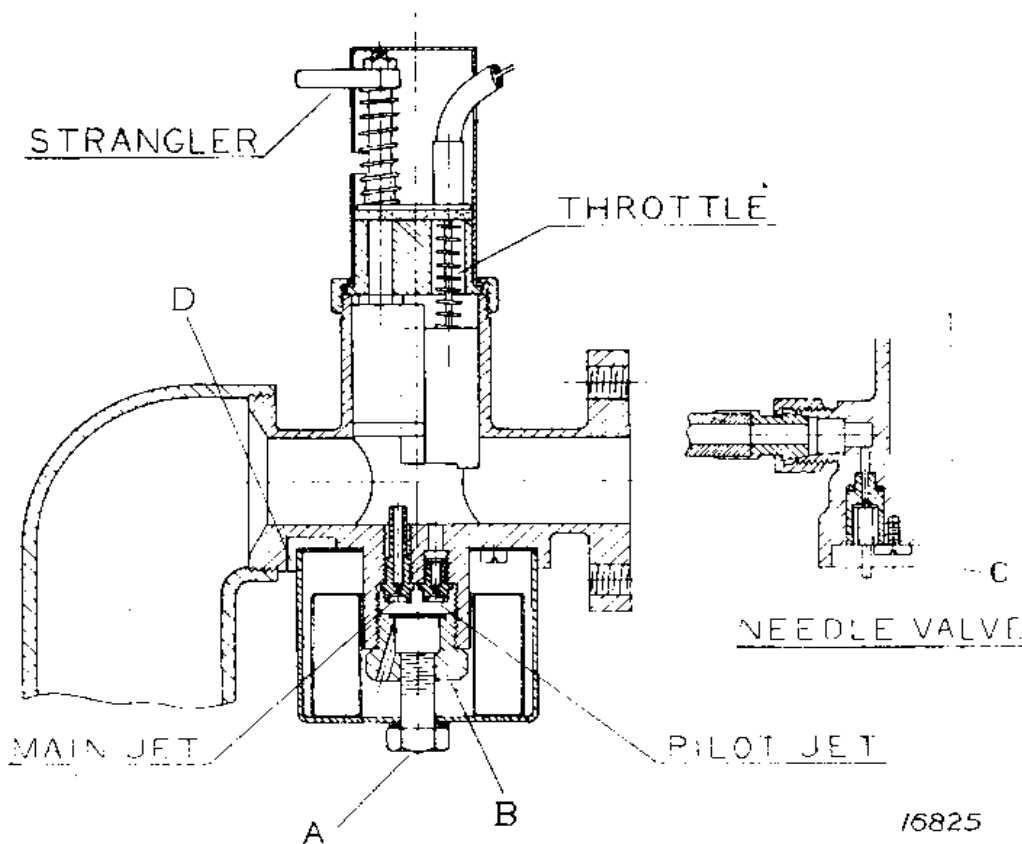


Fig. 12

CARBURETTOR.

Everything possible has been done to make the carburettor dust-proof. It should therefore require but little attention.

To dismantle for cleaning (*See Fig. 12*) unscrew the hexagon headed screw " A " at the base of the carburettor and remove the float chamber. The knurled brass nut " B " carrying the filter can now be unscrewed, leaving the two jets accessible for removal by the special key spanner provided. The pilot or slow running jet is the short jet nearest to the engine. Great care should be taken when cleaning this not to enlarge the

small hole as this would upset the smooth running of the engine. Do not overtighten the float chamber screw when replacing this.

Should the carburettor leak from the float chamber bowl it is probable that either a new needle valve or a new float chamber joint is required. To fit these the carburettor should first be removed from the engine by undoing the screws at the flange joint and disconnecting the rubber hose pipe from the carburettor to the air cleaner.

The float chamber bowl should then be removed as described above together with the float. The slotted needle valve seating screw "C" can now be unscrewed and the valve needle and seating extracted. The conical end of the needle should be smooth; if it is ridged or pitted a new needle and seating should be fitted. The float chamber washer is held in position by 2 small screws and these must first be removed before a new washer can be fitted.

Should the carburettor fail to function properly, look to the following points :

- (a) Is the air vent hole "D" of the float chamber (situated under the float chamber joint washer) clear?
- (b) Is there an air lock in the petrol pipe?
- (c) Is the hole in the tank filler cap blocked up?
- (d) Are the jets, passages and filter clean?
- (e) Have the jets been screwed home gently but firmly?
- (f) Are the union nuts on the petrol pipes tight?

MAGNETO.

The impulse mechanism is set to fire on top dead centre for starting, with the running setting 20° earlier. Do not interfere unnecessarily with the magneto timing; it is set correctly before leaving the Works.

TO REMOVE MAGNETO.

The magneto is directly coupled to the end of the camshaft and is removed by disconnecting the H.T. lead from sparking plug and taking off nuts from studs on magneto flange.

ADJUSTMENT OF MAGNETO BREAKER POINTS.

When making this adjustment it is advisable to remove the magneto from the engine. The maximum gap between the breaker points should be .015" measured by the gauge supplied. The gap can be adjusted by means of the screw head eccentric acting on the fixed contact, after first slackening the locking screw at the other end of the fixed contact. The gap should again be checked after this screw has been retightened.

Providing the points are kept clean and free from oil they should not require adjustment except at long intervals.

RETIMING MAGNETO.

Assuming nothing has been disturbed on the engine, when replacing the magneto, the engine should be turned until the piston reaches top dead centre. Rotate the magneto armature until the impulse pawl releases.

The driven dogs on the magneto shaft are then in line with the driving dogs on the camshaft inside the crankcase. The nuts are then replaced on the studs and tightened up. To check, turn the engine slowly over until the impulse releases; this should occur when the piston reaches top dead centre.

If not correct, adjust by slackening the two nuts clamping the magneto to crankcase and revolve the complete magneto in the desired direction.

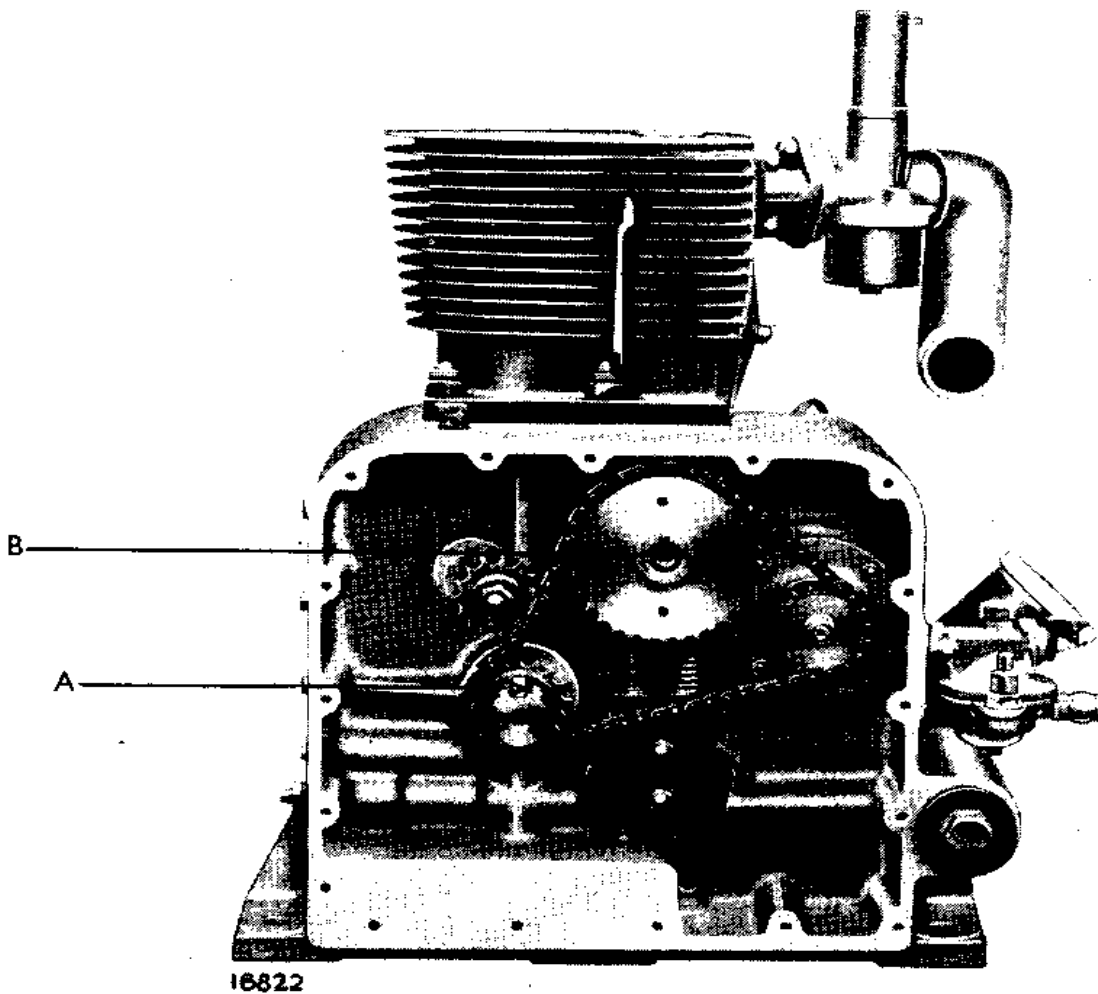


Fig. 13

TIMING CHAIN.

If at any time the timing chain is replaced care must be taken to see that the timing of the valves and the magneto are not disturbed. (See Fig. 13).

Before replacing chain turn the crankshaft until the key 'A' in the driving pinion is in the vertical position, i.e. with piston at the top of its stroke.

Then turn the camshaft until the key "B" (which should be fitted in the **keyway in line between two chain teeth**) is in a horizontal position to the left of the shaft. This position of the camshaft gives approximately the central position in the overlap of the closing of the exhaust valve and the opening of the inlet valve.

The magneto driving spindle should be turned clockwise until the impulse releases.

These are the correct relative positions of the three shafts when the chain is in position.

LUBRICATION OF MAGNETO.

After every 200 hours working, lubricate the magneto with thin engine oil by means of the pull-out type lubricator on the side of the magneto, with the pressure oil-can supplied.

SPARKING PLUGS.

The plug points are bound to burn away slightly and eventually increase the gap. It is a good plan to examine them at intervals cleaning and adjusting when necessary. The gap should be between .030" and .035".

ADJUSTING VALVE TAPPETS.

It is essential that these be checked at regular intervals, as too great a clearance will cause excessive wear, and too little will cause the valves to become badly burnt, necessitating replacement.

The correct clearance between the tappet head and valve stem when the engine is cold is .006" inlet and ~~.006~~ exhaust. $\frac{1}{32}$

To adjust the tappets, remove the cover plate by unscrewing the centre bolt when the tappets and valves will be clearly visible. The tappet head is first held whilst the locknut is being loosened. Then hold the tappet with one spanner, and with a second spanner raise or lower the tappet head by screwing either to the right or left. Having made the adjustment to the gauge, lock the locknut again, and then re-check the clearance.

DECARBONISING AND GRINDING-IN VALVES.

It is strongly recommended that this work should be carried out by the service agent or a reputable garage.

Instructions for this operation are, however, included here, as many users are sufficiently competent to do the work themselves.

First remove the exhaust pipe, and disconnect the petrol pipe from the carburettor, then undo the flange joint of the carburettor and disconnect the rubber hose from the air cleaner. The top of the fan cowl is then removed, after which, the cylinder head can be removed.

This will expose the valve heads. The springs, etc. are reached by removing the cover plate as described previously.

The valve springs should be compressed with a special tool (such as most garages use) when the split collets on the valve stems can be taken off, and the valves drawn through the guides. All carbon should be removed from the valves, valve ports, top of cylinder and cylinder head,

care being taken not to damage the valve seats in the cylinder. Should the bevelled faces of the valves be badly pitted, it is advisable to have these re-ground (most garages are equipped to do this) or else to fit new valves. If the valve guides are worn new ones should be fitted and the valve seats in the cylinders re-faced true with the guides, but this is a job for the Service Agent.

To grind-in the valves, smear a little fine grinding paste (obtainable from any garage) on the bevelled edge of the valve, and a semi-rotary motion applied to the valve in the guide, by means of a screwdriver, brace, or special suction tool. The valve should be lifted occasionally to ensure even distribution of the compound. Never give complete turns to the valve, as this will make grooves in the seating. The operation should be continued until the valve is seating down properly.

This can be checked by making a series of chalk marks on the bevelled face of valve, and turning it slightly in the seating.

If all the chalk marks are cut, the valve is seating down perfectly. It is necessary to clean every trace of grinding paste from all surfaces before re-assembling. A little oil should be smeared on the valve stem before replacing it in guide. Make sure that the split collets are safely in their recess after the valve spring has been released. Check the tappet clearances after re-assembling and adjust if necessary.

Tighten cylinder head bolts gradually and evenly, after first making sure that the copper cylinder head gasket does not need replacing.

STICKING VALVES.

Should a valve become sluggish in action through burnt oil sticking on the stem, it should be taken out, as described above. Both valve guide and stem should be cleaned, and a little clean oil smeared on the stem before replacing.

PISTON RINGS.

Stuck up or worn piston rings will cause excessive oil consumption and loss of power. The fitting of new rings or the removal, cleaning and replacing of existing rings is a job for the Service Agent, and should not be attempted by the user.

CLUTCH.

This is of the automatic type and comes into operation as the engine speed increases, actually taking up the drive at about 600 r.p.m. Should an overload be put on the machine, the engine speed will drop and the clutch begin to slip without stalling the engine. In time the clutch linings will need replacing, just like the brake linings of a car. Should the clutch not transmit the full power of the engine, and slipping occurs, or failure to disengage, so that the gears have to be "crashed" in, call in the Service Agent.

GEAR BOX.

There is nothing in the gear box likely to need attention beyond correct lubrication, for which see lubrication instructions on page 12. Should anything untoward happen, call in the Service Agent.

The gear box is a piece of accurate mechanism and the user is strongly recommended not to attempt repairs to this himself.

FINAL DRIVE GEARS.

The above remarks also apply to these.

SLIPPING STEERING BRAKES.

If at any time a steering brake fails to grip when properly adjusted, it is probable that a small amount of oil has crept along the driving shaft and reached the brake drum. If this occurs, disconnect the steering lever adjusting nuts and remove the top cover. Withdraw the adjusting screw from the brake band and pull the band from around the drum. Wash the band with petrol (not paraffin) and if the linings are glazed, slightly roughen them with the edge of a file. Should the band be saturated with oil, it is advisable to replace the lining, and the Service Agent should be consulted. A removable plate is fitted to the underside of the brake compartment to facilitate the cleaning out of the chamber. Replace the band, adjusting screw, top cover, and re-adjust steering lever.

Care should be taken to make sure that the rubber washer is fitted on to the top of adjusting spring before the cover is replaced. (*See Fig. 6*).

RELINING STEERING BRAKE BANDS.

A time will come when the steering brake bands will need relining. It is strongly recommended that this be done by the Service Agent.

TRACK RUBBER JOINTS.

Being of the patented rubber jointed type, the tracks should require little attention and cost little to maintain.

In due course it may be noticed that the centre rubber pads are splitting or bursting around the connection bolts, but they should still give many more hours service.

It is only necessary to replace these when they drop out.

On the other hand, the main rubbers, i.e. those on either side of the centre rubbers, should be maintained in reasonably good condition, as upon these rests the satisfactory functioning of the track joints. If in course of time these main rubbers become unduly compressed, it will affect the track pitch, and signs of wear and tear will become evident on the sprocket rollers or at the track teeth. If there is any symptom that the track is not meshing properly with the sprocket driving wheel, these main rubbers should be looked to and renewed, if necessary. If a track requires re-rubbering, consult your Service Agent.

TRACK TENSION.

Each track is fitted with a tensioning device (*See Fig. 9*) and all tracks are correctly tensioned before leaving the works. They should not require any alteration for some time.

The tracks are correctly tensioned when, with the tracks clear of the ground, there is $1\frac{1}{2}$ " clearance between the bottom of the weight carrying roller and the face of the track. A convenient method of determining, without jacking up the machine, whether or not the track needs adjusting,

is to depress it midway between the driving and idler wheels ; if, when this is done, the track leaves the rim of the idler wheel, adjustment is necessary. The amount the tracks can be depressed without leaving the idler wheel rim is $1\frac{1}{2}$ ".

It will be seen from the illustration (*Fig. 9*) that there are 2 adjusters, one on the outside frame member and the other on the inside of the chassis below the floor board. To increase the tension on a track slacken the 2 spindle nuts "A" on the idler wheel and tighten the 2 tension screw nuts "B" an equal amount.

Care must be taken to ensure that the idler wheel is central in the rear weight carrying roller, otherwise the wheel will be out of alignment with the track, and undue wear will take place.

Do not adjust the tracks too tightly, as unnecessary power will be absorbed.

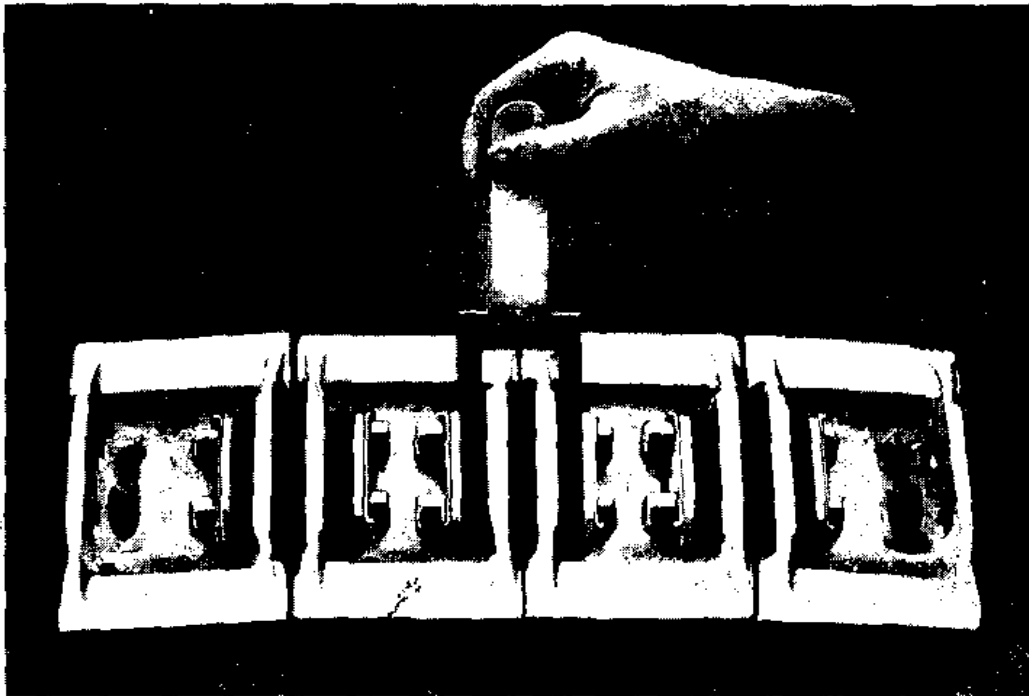


Fig. 14

TRACK PITCH.

This is correct when track claws mesh midway across the driving rollers. Link connecting bolts should be screwed up equally to avoid track becoming out of pitch with the driving sprocket wheels and to such an extent as to give a measurement of $2\frac{1}{8}$ " between the inside faces of plates clamping the main or outside rubbers. (See *Fig. 14*).

TRACK DRIVING SPROCKET WHEELS.

These wheels are constructed with hardened rollers to form a sprocket wheel for the track. It is important that these rollers be kept free. They should not be lubricated but should run perfectly dry.

If a roller becomes tight and is not easily revolved by the fingers, it must be freed by tapping it with a hammer until free of all dust and dirt. Keep a constant watch on these rollers, as, if neglected, it is much more difficult to free them.

FITTING POWER TAKE-OFF EXTENSION SHAFT.

This shaft is for extending the power take-off shaft from the main gear box to the back of the machine and includes a built-in clutch for engaging and disengaging the drive.

- (a) Remove cover plate "A" lubricator "B" and nuts "C" from end housing of gear box.
- (b) Remove cover tube "D" with rear bearing and housing "E" from extension shaft "F".
- (c) Insert rear portion of extension shaft through hole in rear plate of machine, from inside machine.
- (d) Engage dogs on extension shaft clutch with dogs in housing on back plate of gear box, and bolt up housing.
- (e) Push cover tube "D" with rear bearing and housing "E" over extension shaft "F" into cover plate "G" and bolt housing "E" to rear plate.
- (f) Fit lubricator "B" to extension shaft clutch housing "H".
(See Fig. 15).

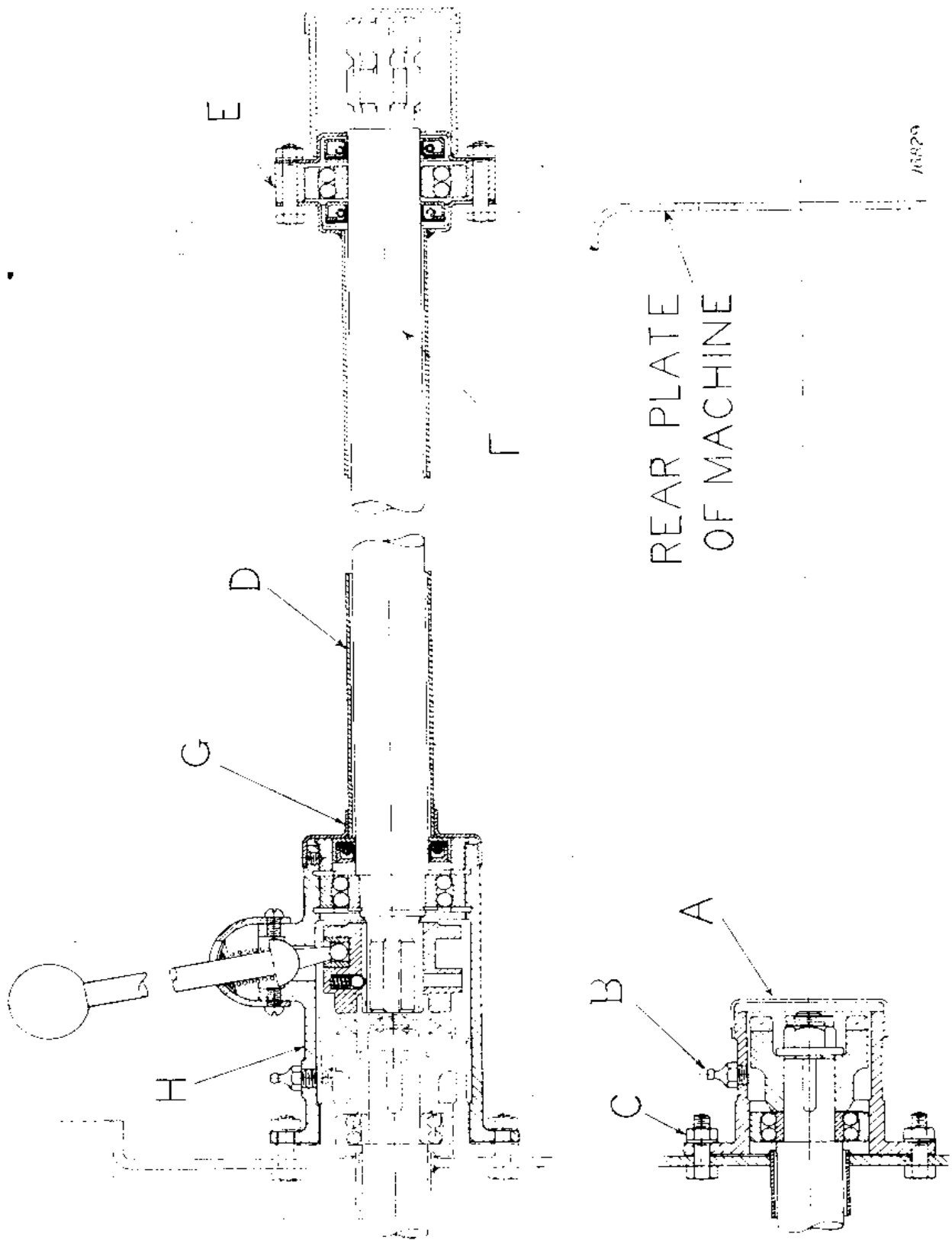


Fig. 15