

MOTOR TRADER Service Data No. 204

NUFFIELD TRACTOR

Types M3, M4, PM3, PM4—1948-53

Manufacturers: Morris Motors Ltd., Agricultural Division, Cowley, Oxford

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PRODUCTION of the Nuffield tractor started in 1948 with the vaporizing oil model, followed later by the petrol model and, later still, by the diesel model using a Perkins P4 engine. This sheet is concerned only with the petrol and vaporizing oil models. The side-valve engine is based on that used in certain Morris-Commercial vehicles. Both four-wheel and three-wheel models are produced. On the latest three-wheelers the single front wheel has been replaced by two wheels, mounted close together on the steering pillar and cambered sharply.

Type designations are:—

| | | |
|-----|-------------|------------------|
| M3 | three-wheel | } vaporizing oil |
| M4 | four-wheel | |
| PM3 | three-wheel | } petrol |
| PM4 | four-wheel | |
| DM3 | three-wheel | } Diesel |
| DM | four-wheel | |

Models with two front wheels close together are indicated by a suffix "V."

In March, 1953, a modified engine was introduced. Engine types are:—

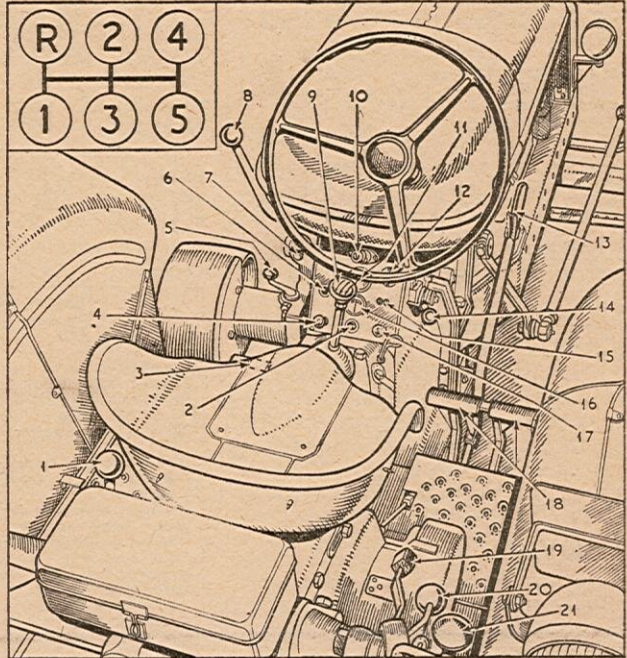
| | | |
|-----|----------------|--------------|
| ETA | Vaporizing oil | } Up to 1953 |
| ETB | Petrol | |
| ETC | Vaporizing oil | } Latest |
| ETD | Petrol | |

Principal differences between the original and latest types are tabulated on the next page.

The tractor serial number, stamped on top of the offside frame casting below the oil filter, is preceded by the type number (M4, PM3 and so on) and the prefix NT. Serial numbers started at M4-NT 501 and PM4-NT 75,001.

Instruments and controls:

1. Power lift and p.t.o. selector lever
2. Ignition switch
3. Clutch pedal
4. Starting mixture control
5. Pulley selector lever
6. Ignition warning light
7. Operating speed adjustable stop
8. Governor control
9. Gear lever
10. Panel light and switch
11. Oil pressure gauge
12. Horn push (if fitted)
13. Handbrake lever
14. Radiator shutter control
15. Inspection lamp sockets
16. Ammeter
17. Starter switch
18. Brake pedals (separate)
19. Auxiliary hydraulic power control
20. Main hydraulic power control
21. Levelling control

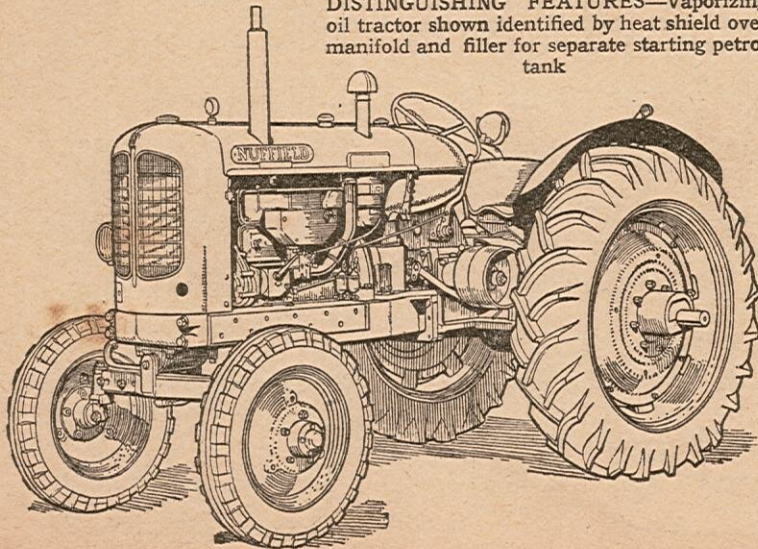


| NUT TIGHTENING TORQUE DATA | | |
|----------------------------|-----------|-------|
| | Bolt size | lb/ft |
| Cylinder head | 1/2 in | 68 |
| Main bearings | 1/2 in | 100 |
| Big ends | 3/8 in | 55 |
| Gudgeon pin clamps | 1/8 in | 17 |

The engine serial number, prefixed by the type letters, is stamped on a disc fixed to the off side of the cylinder block in front of the oil filter. Numbers started at ETA 82232 and ETB 94779.

No special tools are needed, but some are available to facilitate certain operations. Threads and hexagons are B.S.F., but Unified threads are now being introduced gradually.

DISTINGUISHING FEATURES—Vaporizing oil tractor shown identified by heat shield over manifold and filler for separate starting petrol tank



ENGINEERING CHANGES

| | Engine No. |
|---|-------------------------|
| ENGINE | |
| Carburettor—Starter carb. changed from two-position to three-position type | ETA 94000 |
| Cylinder head—Waterways modified, gasket changed from part No. V5534 to NT4810 | ETA 94270 |
| Cylinder block—Waterways modified. Earlier engines, if modified, have "x" added to serial number. Intake strainer added to oil pump | ETA 94856 |
| Hour meter fitted as standard | ETB 106586 |
| Air cleaner—Vokes instead of Burgess. Ignition (magneto only) advanced 1/4 in on flywheel | ETA 106924 |
| ETC, ETD engines introduced (see separate table of differences) | ETB 106589 |
| | ETA 106924 |
| | ETB 106933 |
| | ETC 113404 |
| | ETD 113446 |
| TRANSMISSION | |
| Handbrake lever—Modified type with ratchet introduced | Gearbox No. 7814 |
| Bevel pinion depth increased from 1 1/2 in to 1 7/8 in | 8202 |
| Coupling—Silentbloc type instead of solid type. Interchangeable in sets | 9375 |
| Mainshaft—Double row ball bearing retained by spring ring and spacing washer instead of nut | 9586 |
| Selectors—U-springs replaced by spring-loaded balls and interlock plungers | 9900 |
| GENERAL | |
| ETC, ETD engines introduced | Tractor No. M4-NT 11954 |
| | PM4-NT 75860 |
| Rear axle housing—Brake stop incorporated | M4-NT 12010 |
| | DM4-NT 52732 |
| | PM4-NT 75863 |
| Steering relay lever integral with shaft instead of separate | M4-NT 12221 |
| | DM4-NT 52876 |
| | PM4-NT 75935 |

| ENGINE DATA | | | | |
|---------------------------------|---------------|--------|--------|------|
| Type | ETA | ETC | ETB | ETD |
| Fuel ... | Vap. oil | | Petrol | |
| No. of cylinders | 4 | | | |
| Bore x stroke: | 100 x 120 | | | |
| mm ... | 3.937 x 4.724 | | | |
| in ... | 3.770 | | | |
| Capacity: c.c. in | 230 | | | |
| cu in | 24.8 | | | |
| R.A.C. rated h.p. | 38 | | | |
| Max. B.H.P. at 2000 r.p.m. ... | 38.2 | 38 | 43 | 47.8 |
| B.H.P. at rated (1400) r.p.m. | 33.2 | 34.2 | 37 | 39.5 |
| Max. torque (lb/ft): | — | | | |
| at 1100 r.p.m. | 129.5 | — | 139.5 | — |
| at 1000 r.p.m. | — | 138.5 | — | 149 |
| Compression ratio | 4.5:1 | 4.25:1 | 6:1 | 6:1 |
| Drawbar h.p. at 1400 r.p.m. ... | 29.4 | 29.4 | 30.3 | 30.3 |
| Max. drawbar pull (lb)* ... | 4400 | 4400 | 4600 | 4600 |
| Belt h.p.: | — | | | |
| at 1400 r.p.m. | 32.7 | 32.4 | 33.4 | 37.5 |
| at 2000 r.p.m. | 37.2 | 36 | 40.8 | 45.4 |

* Limited by wheelspin.

ENGINE

MOUNTING

Engine bolted rigidly to forked cast iron frame member which is flange-bolted to gearbox and forms clutch pit. At front, plate bolted to timing cover, and at rear lugs on flywheel housing, rest on frame side members. Dowels locate flywheel housing.

REMOVAL

Before engine can be lifted out, assembly of fuel tank, steering gear, instrument panel, battery cradle and clutch housing cover must be removed.

Remove bonnet, battery and air cleaner. Disconnect pipes, wires and

controls, and detach side panels under fuel tank. Remove starting petrol tank on vap. oil models. Disconnect front end of clutch operating rod through hole on near side of clutch housing, and drive cross-shaft out of pedal. Draw off drop arm. Take out setscrews holding clutch housing to frame casting and gearbox, and extract rubber sealing strip. Lift assembly off by sling.

Remove radiator cowl (four bolts) after disconnecting drag link on three-wheeler. Disconnect shutter control rod, radiator hoses and top stay, and remove core, noting rubber mounting blocks.

Disconnect clutch shaft coupling and extract through-bolt in front half, sliding coupling along splines until shaft can be drawn back and lifted out. On some early tractors with solid coupling, valve spring is inserted be-

| CRANKSHAFT AND CONNECTING ROD DATA | | | | |
|--|---------------|----------|----------|------------------|
| | Main Bearings | | | Crank-pins |
| | No. 1 | No. 2 | No. 3 | |
| Diameter ... | 2 3/8 in | 2 3/8 in | 2 3/8 in | 2 in |
| Length (journal) | 2.090 in | 2 1/2 in | 3 1/2 in | 1 3/4 in |
| Running clearance: | | | | |
| main bearings | ... | | | .002-.003 in |
| big ends | ... | | | .00075-.00275 in |
| End float: main bearings | ... | | | .004-.006 in |
| big ends | ... | | | .0075-.0105 in |
| Undersizes | ... | | | .015, .030 in |
| No. of teeth on starter ring gear/pinion | ... | | | 122/11 |
| Con. rod centres... | ... | | | 8.545 in |

flanges from front. On solid coupling, bolts have D-heads and self-locking nuts. Insert .025 in shim between flat on bolt head and flange to prevent bolt from turning as nut is tightened, making coupling solid. Flanges must have clearance for alignment.

CYLINDER LINERS

On ETA and ETB engines dry liners are tight press fit in block, and have slight flange at top. When new liner is inserted, file flush with top of block and bore out to size. Finishing allowance of .013-.017 in provided after liner has been pressed in.

CRANKSHAFT

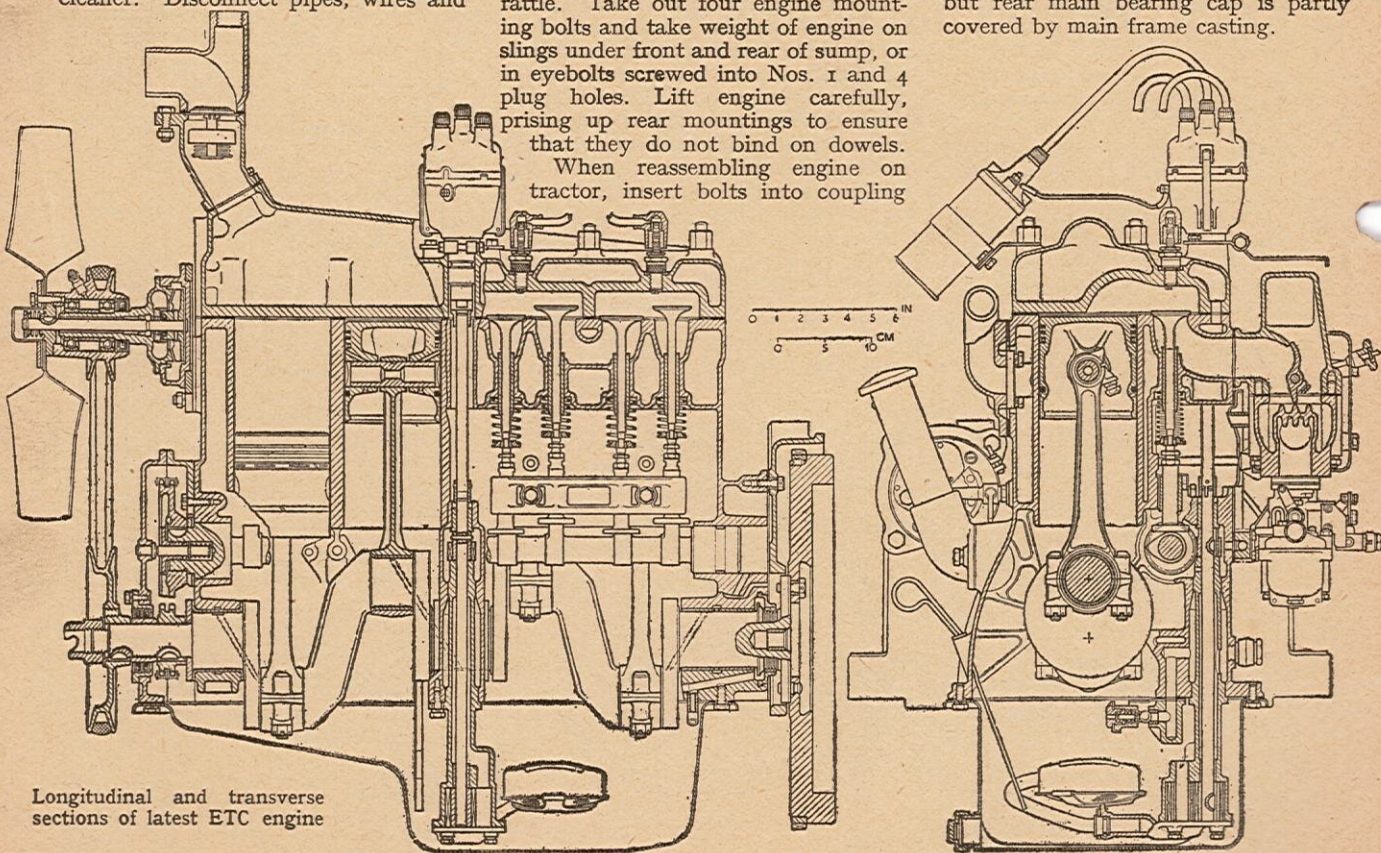
Three main bearings. Thin steel-backed, white metal-lined shells located by tabs. End float controlled by front bearing, flanged both sides. No hand fitting permissible.

Front and centre main bearing shells can be changed with engine in place, but rear main bearing cap is partly covered by main frame casting.

| ENGINE DIFFERENCES | |
|--|--|
| ETA, ETB | ETC, ETD |
| Dry cylinder liners. | No liners. |
| Exhaust valve seat inserts | No valve seat inserts. |
| Valves same size but not interchangeable. | Inlet valves unchanged. |
| Fixed oil intake strainer. | Exhaust valves smaller. |
| Magneto on V.O. models, coil ignition on petrol models. | Floating oil intake strainer. |
| Spark plug size 18 mm. | Coil ignition on all models. |
| Water pump body attached to cylinder block and head. | Spark plug size 14 mm. |
| No thermostat. | Water pump body attached to cylinder block only. |
| Starting handle dog on governor shaft. | Thermostat. |
| Piston ring groove position altered (longer top land on ETC, ETD). | Starting handle dog on crankshaft. |
| Camshaft changed—cam profile modified. | |

tween coupling halves to prevent rattle. Take out four engine mounting bolts and take weight of engine on slings under front and rear of sump, or in eyebolts screwed into Nos. 1 and 4 plug holes. Lift engine carefully, prising up rear mountings to ensure that they do not bind on dowels.

When reassembling engine on tractor, insert bolts into coupling

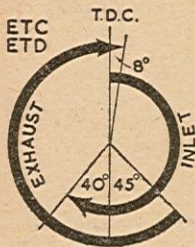


Longitudinal and transverse sections of latest ETC engine

| PISTON DATA | | |
|---|-------------------------|-------------|
| Clearance (skirt) Oversizes ... | .005in, .040in* | |
| Weight without rings or pin ... | 1.8 lb | |
| Gudgeon pin : diameter ... | 1 1/8in | |
| fit in piston ... | Thumb push fit at 65° F | |
| Compression height | 2.25 ± .002in | |
| | Compression | Oil Control |
| No. of rings ... | 2 | 1† |
| Gap ... | .011-.016in | .008-.012in |
| Side clearance in grooves ... | .001in | .001in |
| Width of rings ... | 3/8in | 7/8in |
| * .040in oversize for ETC, ETD only (no liners). † Plain skirt ring 7/8in wide, gap .011-.016in. | | |

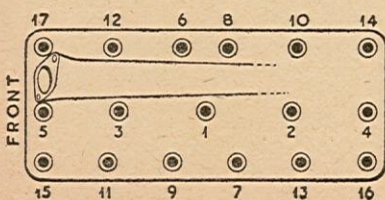
Flywheel, with shrunk-on starter ring gear, spigoted on rear flange of crankshaft, located by two offset dowels and retained by six setscrews. Two 3/8in B.S.F. drawholes. Ring gear retained by three grub screws. To renew, heat new ring in oil at about 220 deg. F, and hammer on to flywheel with chamfer on teeth to rear. Drill three holes 1 1/8in dia., equally spaced and midway between old holes on 1 1/2in pitch circle dia., 7/8in deep on centrelines of teeth, and tap 7/8in B.S.F. Oil impregnated clutch spigot bearing bush pressed into end of shaft.

Timing sprocket, keyed on front end of shaft with Woodruff key, retains thrust washer against shoulder of front main bearing journal (chamfered bore to bearing). Fan pulley keyed on outer end of shaft with separate Woodruff key. Distance-piece between pulley and sprocket runs in double lipped oil seal in housing spigoted and flange-bolted to timing cover. Lip of inner seal faces rear, lip of outer seal to front. Insert distance-piece after timing cover is fitted, with chamfered end inwards. Pulley, with two 1/4in B.S.F. drawholes, retained by plain nut on ETA and ETB engines, starter dog nut on ETC and ETD engines. Shim behind starter dog nut to give correct starting handle position, so that at T.D.C. 1/4, dogs are at about "one o'clock."



Left: Valve timing diagrams for early and later engines

Below: Diagram showing order of tightening of cylinder head nuts



Rear main bearing cap fits in square recess in rear of crankcase, with cork seals at sides. Insert cap and seals together. Split die-cast oil retaining ring fits round return thread on rear of shaft, and in groove in crankcase and cap. Clearance between ring and thread should be .014-.018in. Note that rear two main bearing cap setscrews are longer than front two.

CONNECTING RODS

Big ends thin steel-backed, white metal-lined shells located by tabs. Note that rod and cap have double number stamped on side. These must correspond. Single number on cap indicates cylinder number.

Gudgeon pins cotter-clamped in small ends, clamp towards camshaft.

PISTONS

Lo-Ex aluminium alloy, anodized, solid skirt. Standard size pistons supplied in three grades, stamped AX for nominal bore size, AY for nominal plus .0005in, AZ for nominal plus .001in, to correspond with letters stamped on nearside front corner of cylinder block between water pump and exhaust manifold (letters are stamped vertically, No. 1 at top). On early engines pistons are of Y-alloy, and to prevent confusion with "Y" stamped to indicate material, middle grade was stamped "AZ—" instead of AY.

Oversize pistons supplied in two grades, CX for nominal .020in oversize bore, CZ for .021in oversize.

Pistons are also graded by weight, and stamped L or H with number of drams lighter or heavier than nominal. Permissible variation between lightest and heaviest 4 dr (± 2 dr on nominal).

Chromium plated top compression ring fitted on later engines, may be used on earlier engines.

Big ends will pass through bores. Remove and assemble through top.

CAMSHAFT

Duplex roller endless chain drive, triangulated to drive governor.

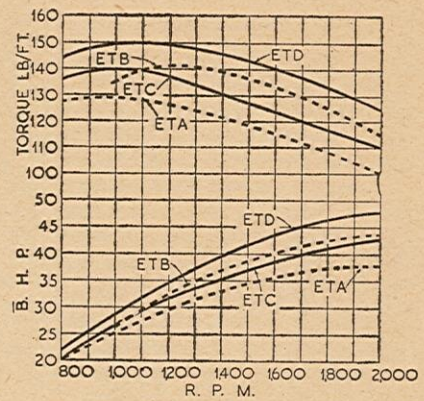
Camshaft sprocket keyed with Woodruff key and retained by large hollow setscrew which also retains spring-loaded plunger. Thrust washer behind sprocket fits with chamfer towards sprocket.

Camshaft runs in three bearings directly in crankcase. End float controlled by spring-loaded plunger in contact with hardened button pressed into timing cover.

Chain adjusted by swinging governor assembly. Three types of adjustment.

First type: — Governor sprocket keyed directly on governor shaft and retained by hand starter dog nut, which passes through oil seal in separate housing bolted to front of timing cover, with slotted holes.

To adjust chain, slacken governor housing bolts and oil seal housing. Prise governor outwards until chain is tight, then mark housing and timing



case, and allow governor housing to move back 1/8in before tightening bolts.

Second type (with hour meter): — Governor sprocket on short shaft spigoted and dogged to governor shaft, and carried in ball bearing in housing bolted to front cover and allowed to swing with governor housing. Through-bolt with distance-piece joins governor housing and front bearing housing, and has adjustable strut.

To adjust chain, detach check strut, slacken bolts and prise governor housing out until chain is tight. Adjust strut so that it just fits on pins, then shorten by 1 1/2 turns, fit on pins and tighten bolts.

Third type is similar to second, but check strut is replaced by pawl and ratchet. To adjust chain slacken bolts and prise governor housing out as far as it will go without forcing, allowing pawl to drop into nearest notch. Ratchet teeth are undercut to give correct tension automatically.

Camshaft can be removed with engine in place. Remove bonnet, radiator cowl and core, magneto or distributor, sump, oil pump, manifolds and tappet blocks. Support front of engine on blocks across crankcase face, leaving crankshaft free to turn.

On engines with early type of governor, without hour meter, remove starter dog cover and oil seal, and timing cover. Slacken governor housing bolts and de-tension chain, which can then be passed over governor sprocket and removed. Camshaft can then be drawn out.

On later engines with hour meter, governor sprocket is carried by timing cover, and governor must be removed. Remove nearside radiator support bracket, starting handle guide and chain tensioner strut (if fitted) or release pawl from ratchet. With fingers of right hand in governor aper-

| CAMSHAFT DATA | | | |
|--------------------------------|-----------------------|---------|---------|
| | No. 1 | No. 2 | No. 3 |
| Bearing journal : diameter ... | 2 1/2in | 2 3/8in | 1 7/8in |
| length ... | 1 1/2in | 2in | 2in |
| Bearing clearance ... | .0025in | | |
| End float ... | spring-loaded plunger | | |
| Timing chain : pitch ... | 3in | | |
| no. of pitches ... | 80 | | |

ture, hold chain clear while removing sprocket, bearing and housing assembly from front. If chain is too tight, unscrew starter dog and drift shaft inwards through bearing, so that housing can be removed and sprocket extracted from chain separately.

To retine valves when reassembling timing drive, turn crankshaft to T.D.C. 1/4, when T-mark on crankshaft sprocket will be at bottom. Turn camshaft sprocket until T-mark is at about "ten o'clock." Chain has two bright links 22 pitches apart. Fit chain so that bright links correspond with T-marks on sprockets.

On early engines without hour meter, mesh governor sprocket with chain so that starting handle dog is 20-30 deg. beyond vertical, or about 'one o'clock.' Adjust chain by swinging governor until there is no more than 1/4 in movement either way midway on bottom run. Starter dog oil seal fits in housing with lip *outwards*.

On later engines with hour meter, pass chain over crankshaft and camshaft sprockets, and hold slack through governor aperture while fitting timing cover. Then offer up assembly of governor sprocket, bearing housing, oil seal and starting handle dog, passing chain over sprocket from rear. On latest engines with starter dog on crankshaft, oil seal housing on governor sprocket shaft is replaced by cover.

| VALVE DATA | | | |
|----------------------------------|----------|----------|----------|
| | Inlet | Exhaust | |
| | | ETA, ETB | ETC, ETD |
| Head diameter ... | 1 1/8 in | 1 1/8 in | 1 1/8 in |
| Stem diameter ... | 3/8 in | 3/8 in | 3/8 in |
| Face angle ... | 30 deg | 30 deg | 30 deg |
| Tappet clearance (cold) | .014 in | .014 in | * |
| Spring length free ... | | 2.704 in | |
| test length ... | | 2.063 in | |
| at load ... | | 48 lb | |
| * Inlet .004 in, exhaust .018 in | | | |

VALVES

Side by side. Same size on ETA and ETB, but exhaust valves have stellite seats. On ETC and ETD, exhaust valves are smaller.

Split cone cotter fixing. Single springs with closed coils upward.

Valve guides interchangeable. No shoulder. Press in, chamfered end downwards, until top is 1 3/8 in below top face of cylinder block.

On ETA and ETB, exhaust valve seat inserts pressed in and retained by spring ring in internal groove. To renew, break out old insert after weakening by grinding. Spring ring on new insert can be closed by hose clip while insert is being pressed in.

TAPPETS

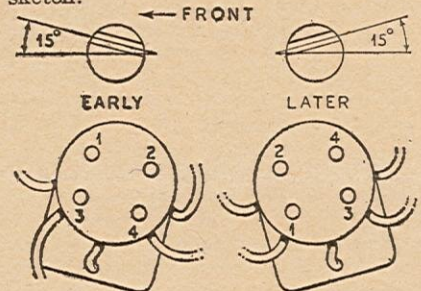
Mushroom tappets in two detachable guide blocks. Each block retained, with sheet metal tray, by two setscrews and hollow dowels.

LUBRICATION

Gear pump in sump. Integral drive housing spigoted in crankcase and retained by one setscrew. Upper end of drive shaft runs in flanged bronze bush pressed into crankcase from below, and has offset slot for distributor or magneto drive. Skew drive gear pressed on to shaft, pinned and keyed with Woodruff key.

To dismantle pump, detach bottom cover with intake strainer and tip out driven gear. Extract spring ring from driving gear bore, and tap shaft through gear for about 3/8 in. Then grip driving gear in vice and go on tapping out shaft. Extract Woodruff key and draw shaft out of housing.

When assembling oil pump on engine, turn crankshaft to T.D.C. 1/4, No. 1 firing, and offer up pump so that when it is home offset slot is in position shown in left-hand sketch. Shaft will turn about 30 deg. anti-clockwise as it is pushed in. On later magneto fitted engines, H.T. leads are moved round for tidier run, and slot should be in position shown in right-hand sketch.



Oil delivered through drive housing and external pipe round rear of engine to Vokes full flow filter on off side, with renewable element No. B 8648. Element is spring-loaded upwards against seating on filter body, which acts as bypass valve if element is choked.

Non-adjustable spring-loaded ball and plunger relief valve bolted to bottom face of crankcase above oil pump. Early valve was vertical. Later horizontal valve incorporates sludge trap. If valve plug is not locked, it should be drilled and wired. Latest plugs have tabwasher. Oil pressure 30 lb at normal speed, 10-15 lb idling.

IGNITION

Anti-clockwise distributor (ETB, ETC, ETD) or vertical magneto (ETA) with centrifugal control, spigoted in cylinder head, located by clamp plate and setscrew, and driven by loose quill with offset slot, engaging top of oil pump drive shaft.

Set contact points when T.D.C. mark on flywheel, visible through inspection trap on near side of clutch housing, is specified distance above pointer (before T.D.C.), as follows:—

- ETA (early, with Burgess air cleaner) 1 in (7 1/2 deg)
- ETA (later, with Vokes air cleaner) 1 1/2 in (11 1/2 deg)
- ETB 3/4 in (5 deg)
- ETC, ETD T.D.C.

| | IGNITION DATA | | | |
|--|------------------|-------------|--------------|----------|
| | ETA | ETB | ETC | ETD |
| Ignition ... | magneto | coil | coil | coil |
| Advance range, centrifugal (crank deg.) ... | 18-22 | 22-26 | 36-40 | 22-26 |
| Advance starts (crank r.p.m.) ... | 600-800 | 600-900 | 250-550 | 600-900 |
| Max. advance (crank r.p.m.) ... | 2300 | 1900 | 2300 | 1900 |
| Cam angle (closed period) ... | 35° | 49° | 60° | 60° |
| Contact spring tension ... | 20-24 oz | 20-24 oz | 20-24 oz | 20-24 oz |
| Condenser capacity | .2 mf | .2 mf | .2 mf | .2 mf |
| Firing point | 7 1/2° B.T.D.C.* | 5° B.T.D.C. | T.D.C. | T.D.C. |
| Firing order | 1 3 4 2 | | 1 3 4 2 | |
| Contact breaker gap ... | .010-.012 in | | .014-.016 in | |
| Plugs: make ... | Champion | | Champion | |
| type ... | 7 Com | | N 7 | |
| size ... | 18 mm | | 14 mm | |
| gap ... | .025 in | | .030 in | |
| * On later engines with Vokes air cleaner 11 1/2°. | | | | |

GOVERNOR

Centrifugal constant speed type, variable by hand control. Lever has four positions:—

| | Vap. Oil | Petrol |
|-----------------------------------|------------------------------------|---|
| | Press outwards, forwards past stop | Starting (throttle butterfly shut) |
| Forwards against stop | Idling | Starting (throttle butterfly slightly open) |
| Back against adjustable stop | Normal working speed | |
| Press outwards and back past stop | Maximum speed | |

On later tractors hour meter, calibrated in hours at 1100 r.p.m., is fitted on governor adjustable bracket and driven through idler gear from governor shaft.

Idling adjustment is by moving lever pivot bracket. Idling speed should be 400-500 r.p.m. for petrol, 550-600 r.p.m. for vap. oil. Normal running stop adjustable by knurled knob between 1000 and 1600 r.p.m. Rated speed 1400 r.p.m. Maximum speed stop is set to 2000 r.p.m.

If governor is disconnected, link should be adjusted so that throttle butterfly is shut when governor lever is at highest position.

Oil dashpot in base of governor housing, provided to damp out "hunting" and give smooth throttle action, can be adjusted by screw and locknut, covered by cap nut, to regulate rate of flow. With engine stopped, pull control lever back until governor lever falls to lowest position. Raise lever until throttle is fully closed, hold for a few seconds to allow oil to fill damper cylinder, then allow lever to fall, which should take 1 1/2-2 seconds. Screw regulator screw in to reduce flow, out to increase.

| FUEL SYSTEM DATA | | | | |
|--|---|------------------|---------------------|-----------------------|
| Fuel Engine type | Vaporizing oil | | | Petrol ETB, ETD |
| | ETA | | ETC | |
| | Early | Later | | |
| Carburettor: make ... type ... | 30 FV 3 | Solex 30 FV 3 | vertical 30 FV 3 | 30 FV 2 |
| Settings: | | | | |
| Choke tube | 30/24 | 30/23 | 30/24 | 30/23 |
| Main jet | 110/51 | 105/53 | 110/51 | 105/54 |
| Main jet cap ... | 12/300 | 12/300 | 12/300 | 12/300 |
| Pilot jet | 60 | 60 | 60 | 55 |
| Starter carb. jet | 80 | 100 | 100 | — |
| Air jet ... | 5 | 6.5 (2 off) | 6.5 (2 off) | — |
| Needle valve ... | 2.5 mm | 2.5 mm | 2.5 mm | 2.5 mm |
| Air cleaner: early ... later ... | Burgess ORA/060/3 oil bath Vokes D38798 oil bath | | | |

Adjustment for bobweight thrust button inside housing. Take off top cover, place straight-edge across top of housing, and measure distance between pad on actuating

lever and straight-edge as each bobweight is prised out to full extent. Distance should be $\frac{3}{16}$ in.

Bobweights pivot on spindles with 11 needle rollers on each side. Spindles retained in shaft lugs by split pins.

When governor housing is re-fitted, remove top cover and pour in $\frac{1}{2}$ pint of engine oil.

COOLING SYSTEM

Pump and fan. Thermostat on ETC and ETD engines. Pump has carbon and rubber seal, and shaft is spring-loaded.

To remove pump from engine, remove radiator shell and core first.

To dismantle pump, remove fan blades, plate and hub cap. Remove rear part of pump body (four nuts behind pulley). Extract spring ring at front end of shaft, releasing collar and spring, driving flange and Woodruff key. Shaft and impeller (pinned) with seal assembly can then be drawn out. To dismantle pulley bearings, extract spring ring retaining front bearing on sleeve, and drive sleeve and front part of body out through bearings and oil seal. Extract oil seal, which must be scrapped, and spring ring retaining rear ball bearing in pulley. Press out bearings, with distance-piece between inner races.

Shaft runs in oil impregnated bush in body, with rubber sealing ring at rear.

Seal assembly consists of rubber seal (spring towards impeller), driving peg and carbon disc with retainer. When fitting rubber seal on shaft, use soap, not oil, as lubricant.

Adjust fan belt by swinging dynamo until there is about 1 in movement either way on longest run on belt. To renew belt detach sealing plate at top of fan cowl on off side, and ease belt past fan blades.

TRANSMISSION

CLUTCH

Borg & Beck single dry plate, graphite thrust release bearing.

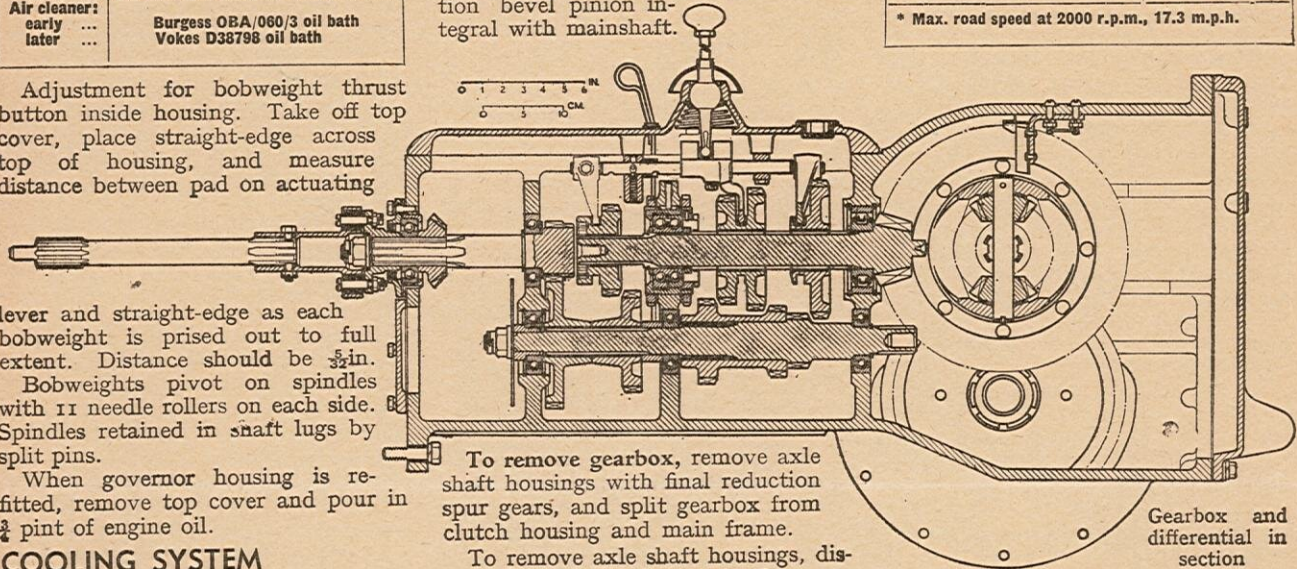
Only external adjustment is on pedal push rod, to give 1 in free movement at pedal pad.

Access to clutch for service after removal of fuel tank, steering gear and clutch housing assembly, and clutch shaft (See "Engine—Removal").

GEARBOX

Five forward speeds, sliding gears, direct drive on top gear. First reduction bevel pinion integral with mainshaft.

| TRANSMISSION DATA | | | |
|---|---------|--------------|--------------|
| CLUTCH | | Borg & Beck | |
| Make ... | ... | Type | 11A6-G |
| Type ... | ... | Springs: No. | 12 |
| colour ... | ... | free length | Green |
| Linings: thickness | ... | dia. ext. | 2.56 in |
| dia. int. | ... | dia. int. | 1.15-1.15 in |
| GEARBOX | | ratio | |
| No. of speeds ... | ... | 5 | m.p.h. |
| Final ratios | 1st ... | 139.0 | 1.59 |
| and road | 2nd ... | 88.2 | 2.52 |
| speed at | 3rd ... | 62.6 | 3.53 |
| 1400 engine | 4th ... | 42.5 | 5.2 |
| r.p.m. | Top ... | 18.3 | 12.1* |
| Rev. | ... | 80.0 | 2.77 |
| Crown wheel/bevel pinion teeth | ... | 35/8 | |
| Final reduction spur teeth | ... | 46/11 | |
| * Max. road speed at 2000 r.p.m., 17.3 m.p.h. | | | |



To remove gearbox, remove axle shaft housings with final reduction spur gears, and split gearbox from clutch housing and main frame.

To remove axle shaft housings, disconnect power lift linkage, and remove drawbar and frame. Disconnect lamp wiring. Chock front wheels, and place blocks between front axle and main frame to prevent tilting. Jack up rear of tractor and support axle housings. Remove rear wheels and hubs. Disconnect brake rods at rear ends, and remove mudguard and floor plate assemblies with side lamps and wiring.

Raise tractor until axle housings are clear of supports, and take weight of housing on slings or eyebolts fitted in second hole from centre of front and rear flanges. Take out housing flange bolts and use two of them ($\frac{7}{8}$ in B.S.F.) in tapped drawholes to break joint. Draw housing out sideways.

Remove gearbox rear cover or hydraulic lift, power take-off shaft and belt pulley ($\frac{7}{8}$ in B.S.F. drawholes in all housing flanges). Magnetic filter (plug below power lift control shaft) must be removed before drawbolt is fitted.

Raise rear of tractor and block up under main frame. Remove brake pedal bracket and handbrake (if fitted). Take weight of gearbox on slings through final drive apertures, one sling passed round lugs in front of apertures. Take out clutch housing and main frame flange bolts, noting that fourth bolt down on each side is fitted bolt, and draw gearbox back clear of clutch.

To dismantle gearbox, remove top cover with lever, selector rods and forks. Split coupling, engage two gears to lock box, undo coupling flange nut and draw off flange. Remove oil seal housing, and turn layshaft so that cutaway in oil thrower is at top. Using $\frac{3}{8}$ in B.S.F. drawbolts, draw out front ball bearing and housing, at same time drifting primary shaft forward with rear ball bearing.

Place block of wood under crown wheel, and remove differential bearing housing setscrews. Draw housings out using $\frac{7}{8}$ in B.S.F. drawholes.

Engage two gears to lock mainshaft, and undo ring-nut in front of centre bearing inner race. On later tractors nut is replaced by spring ring and distance collar. Shaft can then be driven out to rear with rollers and inner race of rear bearing, gears being lifted off as they are released. Bevel pinion setting is governed by position of centre bearing housing, and need not be disturbed.

To remove centre bearing, slacken ring nuts and remove rear nut. Slacken grub screw, and tap housing and bearing out to front. Bearing consists of double-row semi-thrust ball bearing with split outer race, retained in housing by internal ring nut locked by countersunk screw. Note that housing is undercut for front race, which is located only by side faces.

Detach front cover, undo nut at front end of layshaft, take off washer and oil thrower disc. Drive layshaft to rear with rear ball bearing, supporting 2nd/3rd gear cluster so that centre ball bearing stays in box. Layshaft front ball bearing, with inner sleeve, and mainshaft rear roller bearing outer race, retained in box by spring rings.

Take out reverse idler spindle locking setscrew, and use as drawbolt in rear end to extract spindle. Lift out bushed reverse idler cluster.

When reassembling primary shaft, fit bearing housing with shims (split) so that distance between face of pulley drive bevel pinion and front edge of pulley aperture (measured with straight-edge on centreline) is $\frac{1}{8}$ in.

When reassembling mainshaft with spring ring in front of centre bearing, if new parts have been fitted, select distance collar which will just allow spring ring to enter groove, as end float on shaft must not be more than .003in. Collars are in five thicknesses: .169, .172, .175, .178 and .181in.

Check bevel pinion setting by measuring distance from pinion face to straight-edge set between bores of

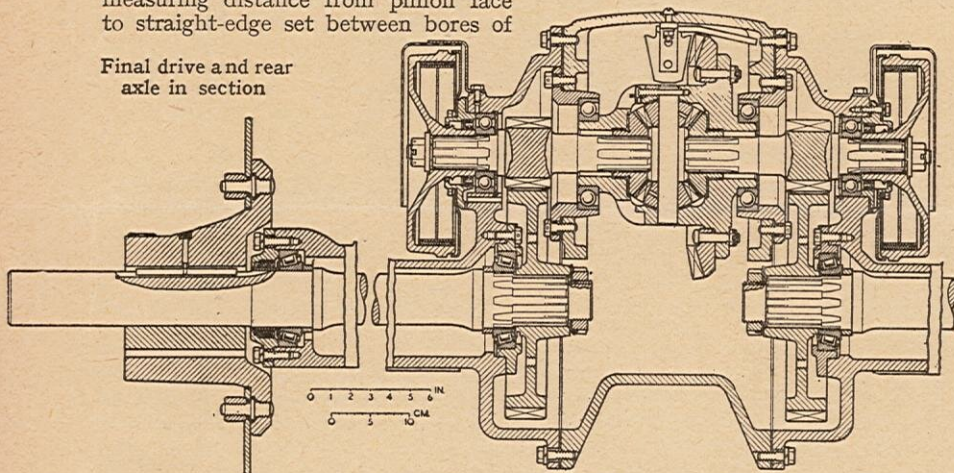
When housing setscrews are tight, test for backlash (.015-.018in) and if necessary transfer shims. Bearings must not be preloaded.

FINAL DRIVE

Final drive spur pinions, splined at inner ends in differential and at outer ends to brake drums, run in ball bearings in axle housings. Hub of brake drum passes through lipped oil seal in housing. On early tractors additional ball bearings in differential bearing housings supported pinion shafts.

Axle shafts run in double taper roller bearings at outer end, parallel roller bearing at inner end, retained by final drive spur gear with nut (gears have four $\frac{1}{2}$ in B.S.F. draw-holes). On latest tractors shafts run in taper roller bearings at either end. Bearings adjusted by shims (.003, .010, .025in) to free without play. Double lipped oil seal (both lips inwards) and felt seal in bearing cover. If outer pair of taper roller bearings is extracted, note oil retaining collar behind outer race of inner bearing.

Final drive and rear axle in section



differential bearing housings. Make sure that straight-edge is on centreline of mainshaft, and measure with inside callipers. On early tractors, with pinion $1\frac{1}{8}$ in deep, dimension should be 1.3125in. Later pinion is $1\frac{3}{8}$ in deep, and dimension should be 1.1875in.

DIFFERENTIAL

Crown wheel spigoted and bolted to flange of one-piece differential cage. Side bevel gears run in bushed cage, with flat thrust washers. Planet bevel pinions have spherical washers. Differential assembly carried in semi-thrust ball bearings in housings spigoted and flange-bolted to gearbox with shims for bearing and mesh adjustment.

If new parts are fitted, assemble housings without shims, tighten near side first, and tighten other side lightly until there is no play. Measure clearance of offside housing flange with feelers. Add .003-.006in to this figure for total thickness of shims (.003, .010, .025in available), which should be divided equally between sides.

CHASSIS

BRAKES

Girling mechanical on final drive pinion shaft extensions, controlled by independent pedals. Handbrake lever, fitted on later tractors, acts on offside brake, or both brakes if pedals are locked together.

To adjust, tighten square-ended adjuster on each backplate, and back off one click after applying pedal several times to centralize shoes. Both pedals must be balanced to work equally when locked together.

| BRAKE DATA | |
|------------------------|--------------------|
| Drum diameter | 9in |
| Lining : length | 7 $\frac{1}{2}$ in |
| width | 1 $\frac{1}{2}$ in |
| thickness | $\frac{1}{8}$ in |
| No. of rivets per shoe | 10 |

FRONT AXLE

Three-piece beam adjustable in steps for track. Centre section pivoted in bushed casting bolted to main frame. Pivot pin has nut at rear

| POWER TAKE-OFF DATA | |
|------------------------|---------------------|
| Belt pulley : diameter | 10 $\frac{1}{2}$ in |
| face width | 6 $\frac{1}{2}$ in |
| r.p.m.* | 1112 |
| Belt speed (ft/min)* | 3110 |
| P.T.O. shaft r.p.m.† | 527 |

* at 1500 engine r.p.m.
† at 1400 engine r.p.m.

end, and Woodruff key at front end. Tap out to front, noting distance-washer behind front lug.

King pins, integral with stub axles, work in bushed beam eyes. Assembly retained by nut at top. Steel thrust washer (chamfer downwards) and cover pegged to bottom of king pin rotate against bronze washer pegged to axle beam. Rubber sealing ring in annular groove at top of beam seals against washer pegged to king pin and retained with cover by top nut. Tighten nut and back off until king pin is free without play.

Wheel hubs run on taper roller bearings, with lipped oil seal (lip *outwards*) pressed into hub outside inner bearing, with washer between seal and bearing on later tractors. Seal runs on distance collar covering radius on stub axle and retaining dust cover (pegged to stub axle). Adjust bearings to be free without play.

Drag link ball joints are sealed side plug type, serviced as assembly.

Drag link connected to divided track rod by relay levers. Drag link lever integral with shaft, turns in bushes in axle beam. Track rod Y-shaped lever cotter-clamped on squared lower end of shaft. On earlier tractors drag link lever is cotter-clamped on square, and rubber seals are fitted at top and bottom. Track rod ends have flanged bushes for pin joints, with rubber sealing rings in annular grooves at top and bottom. Earlier bushes were not flanged. Track rods have telescopic track adjustment and nearside rod has turnbuckle for toe-in adjustment.

On single front wheel models, drag link is connected to steering arm, cotter-clamped to square on top of steering head, by relay lever and pin-jointed link. Steering head runs in taper roller bearings with felt seal at top, lipped rubber seal below, in casting bolted to front of main frame.

Hub, integral with split rim, runs on taper roller bearings on spindle located in forked ends of steering fork by through-bolts. Bearings adjusted by sleeve nut on spindle. Oil seal housings, retaining outer races in hub, carry lipped rubber and felt seals.

On V-twin front wheel models, drag link is connected to lever on cross-shaft, which turns steering column through bevel gears.

| STEERING DATA | |
|---------------------------|------------------|
| Castor | 4° |
| Camber | 2° |
| King pin inclination | 0° |
| Toe-in | $\frac{1}{8}$ in |
| No. of turns lock to lock | 4 $\frac{1}{2}$ |

STEERING GEAR

Worm and nut. Lower end of column floats in nut, which is carried by trunnion levers clamped on squared drop arm shaft.

Steering column and tube can be removed without disturbing fuel tank. Detach offside panel and take out two column tube clamp setscrews. Turn steering wheel clockwise, winding worm out of nut.

For access to drop arm shaft and nut, remove tank, disconnect control wires, and oil pipe to panel, and remove steering gear cover. Trunnion levers cotter-clamped on square drop arm shaft, which runs in bushes in clutch housing. When removing drop arm (cotter-clamped on square) note D-washer in lever slot, which should be fitted if missing in earlier tractors. Washer allows .005-.001 in nip on clamp.

Upper end of column supported in double row self-aligning ball bearing retained by nut (early) or single row bearing retained by spring ring.

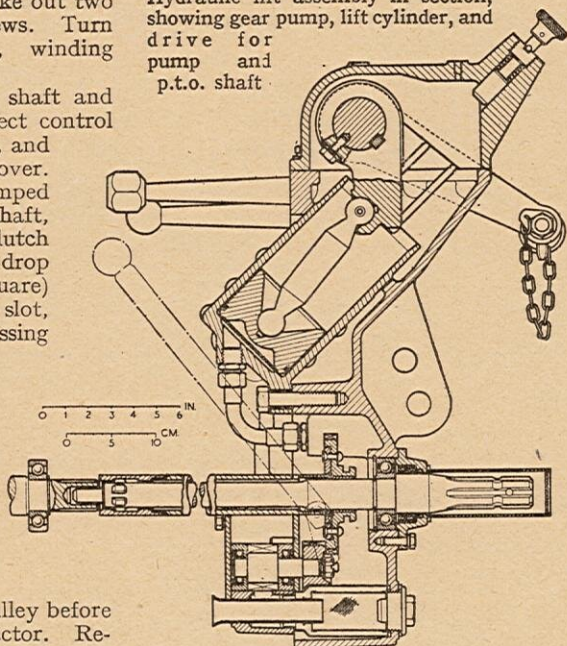
BELT PULLEY

To dismantle, draw off pulley before removing housing from tractor. Remove housing and extract operating lever (setscrew). Detach bearing cap with oil seal (lip inwards), tap housing to free bearing, and draw out pulley shaft with ball bearing and sliding dog. Draw off bevel gear (noting shims behind), extract inner oil seal and spring ring retaining bearing, and drive assembly of bevel gear shaft, ball bearings and distance-piece out towards gear end.

HYDRAULIC LIFT

System consists of gear pump driven by spur gear from rear end of p.t.o. shaft, feeding lift cylinder through control valve. Pump, lift cylinder and control valve assemblies bolted to

Hydraulic lift assembly in section, showing gear pump, lift cylinder, and drive for pump and p.t.o. shaft.



| HYDRAULIC SYSTEM DATA | |
|------------------------------------|-------------------|
| Max. pressure | 950-1250 lb/sq in |
| Lifting capacity (draft link ends) | |
| Lift rod : closed | 2770 lb |
| in 2nd position | 2630 lb |
| in 3rd position | 2400 lb |
| fully extended | 2370 lb |
| Vertical lift at draft link ends | 22in |
| Time to lift at 1,400 r.p.m. | 1 1/2 sec |
| Time to drop (max. rate) | 1 1/2 sec |
| Aux. power tapping | 1/2 in B.S.P. |

| GENERAL DATA | | | |
|------------------------------|------------|--------------|--------------|
| | M3, PM3 | M4, PM4 | M3V, PM3V |
| Wheelbase | 6ft 11in | 6ft 6in | 6ft 10 1/2in |
| Track : | | | |
| front (1in steps) | — | 48-76in | 6-8 1/2in |
| rear | 53-88in | 53-88in | 53-88in |
| Turning circle (unassisted) | 16ft 2in | 21ft 6in | 21ft 4in |
| Ground clearance : | | | |
| front axle | 1ft 11in | 1ft 6 1/2in | — |
| rear axle | 1ft 11in | 1ft 11in | 1ft 11in |
| Weight (full tanks) | 42 1/2 cwt | 43 1/2 cwt | 41 1/2 cwt |
| Tyre size : front (standard) | 9.00-10 | 6.00-19 | 6.00-16 |
| rear | 11-36 | 11-36 | 11-36 |
| Overall length | 10ft 6in | 10ft 3in | 10ft 6in |
| Overall width | 6ft 11in | 6ft 11in | 6ft 11in |
| Overall height (silencer) | 6ft 11in | 6ft 10 1/2in | 6ft 10 1/2in |

* Full equipment, inc. hyd. lift and belt pulley.

rear cover which carries cross-shaft and lift arms.

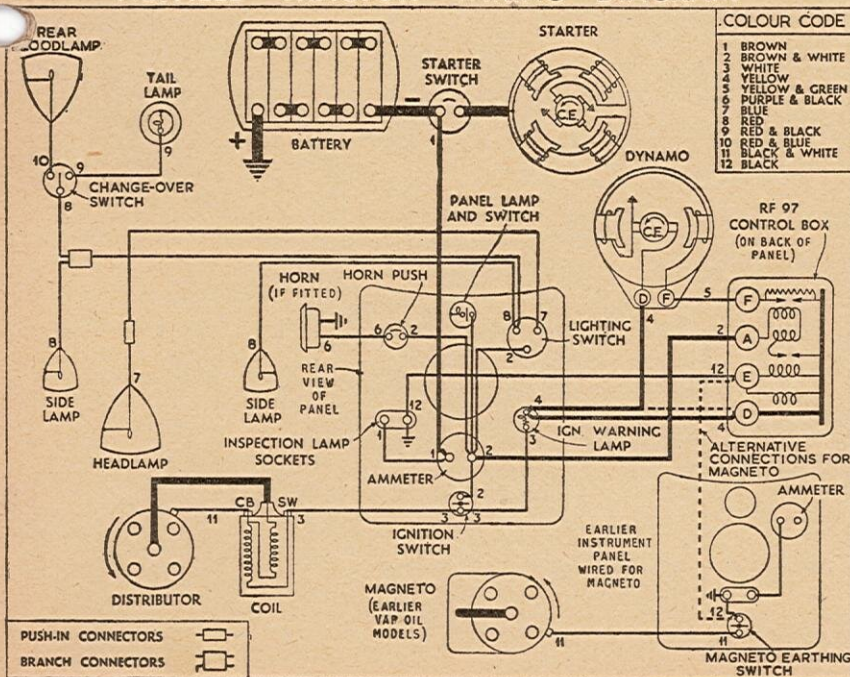
Selector lever has three positions. On early tractors these were: Neutral; p.t.o. engaged; p.t.o. and power lift engaged. Selector moved gear and shaft coupling dog together, final movement engaging gear with pump pinion.

On later tractors positions are: Neutral; power lift engaged; p.t.o. and power lift engaged. Gear is in constant mesh with elongated pump pinion, and is mounted on long sleeve with coupling dogs to layshaft and p.t.o. shaft at front end. Selector moves gear and sleeve.

Two hydraulic control levers operate main power lift (round knob) and auxiliary power (square knob). Lift to raise, press down to lower. Lift arms can be locked up by plunger acting on ram arm. Main power tapping on near side (painted circle). Auxiliary power tapping on off side (painted square).

Regulating screws (main control, round knob. Aux. control, square knob) control lowering speed by acting as stops for control levers. Magnetic filter on off side, just below control shafts, is located in oil stream from low pressure relief valve.

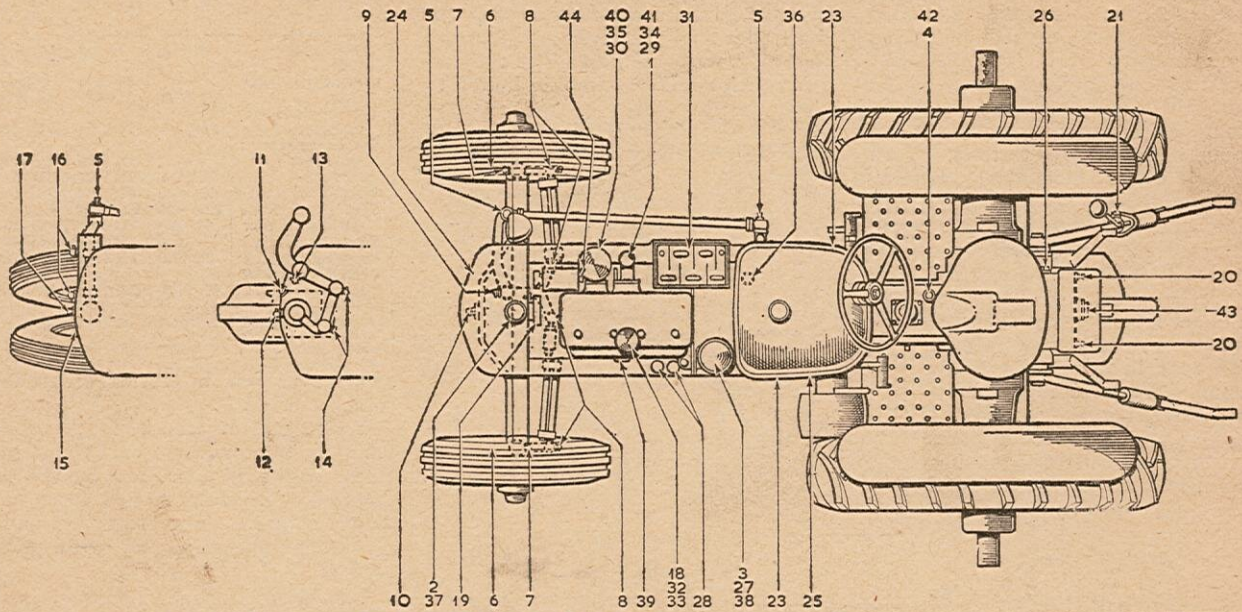
NUFFIELD TRACTOR WIRING DIAGRAM



| ELECTRICAL DATA | | |
|-------------------|----------|-------------|
| Lucas Equipment | | |
| | Model | Service No. |
| Dynamo : early | C 39 P | 22255 |
| later | C 39 P-2 | 22259 |
| Starter | M 45 G | 26008 |
| Starter switch | ST 19 L | 76423 A |
| Ignition switch | PS 6 | 314144 |
| Lighting switch | PPG1 | 31159 A |
| Control box | RF97 | 37103 A |
| Battery | GTW9A | — |
| Distributor : ETB | D 3A4 | 40240 D |
| ETC | D 3A4 | 40341 A |
| ETD | D 3A4 | 40344 A |
| Coil | B 12 | 45012 A |
| Magneto : ETA | 4VRA | 44107 A |
| Headlamp | L-H-0 | 50129 A |
| Rear floodlamp | L-H-0 | 50819 A |
| Side lamps | LD 109 A | 52153 A |
| Tail lamp | AT 201 L | 53007 A |
| Horn | HF 1235 | 069344 |

| BULBS | | | |
|-------------------------|---------|---------|-----|
| | Voltage | Wattage | Cap |
| Head and rear floodlamp | 12 | 36 | SCC |
| Side and tail lamps | 12 | 6 | SCC |
| Ignition warning lamp | 2.5 | .2 | MES |

NUFFIELD TRACTOR MAINTENANCE DIAGRAM



KEY TO MAINTENANCE DIAGRAM

DAILY OR EVERY 10 HOURS

- 1. Engine sump
- 2. Radiator
- 3. Air cleaner oil bath
- 4. Gearbox
- 5. Drag link ball joints (2)
- 6. Front wheel hubs (2)
- 7. King pin bearings (2)
- 8. Track rod joints (4)
- 9. Relay lever pivot (1)
- 10. Front axle trunnion (1)
- 11. Front wheel hub (1)
- 12. Front pivot bearing
- 13. Relay lever pivot (1)
- 14. Steering link joints (2)
- 15. Front wheel hubs (2)
- 16. Steering relay shaft (2)
- 17. Steering pillar (1)

Top up

M4, PM4

M3, PM3

MV, PMV

Grease gun

WEEKLY OR EVERY 50 HOURS

- 18. Magneto (M3, M4)—Top up base
- 19. Water pump bearings (1)
- 20. Hydraulic lift cross-shaft (2)
- 21. Levelling control on lift link (1)
- 22. Hand clutch release shaft (if fitted) (1)
- 23. Brake and clutch linkage
- 24. Radiator shutters
- 25. Governor control
- 26. Hydraulic lift—Clean magnetic filter
- 27. Air cleaner—Clean and refill bowl
- 28. Fuel filters—Clean filters and sediment bowls

Oil can

Grease gun

FORTNIGHTLY OR EVERY 100 HOURS

- 29. Engine sump (M3, M4)—Drain and refill
- 30. Engine oil filter (M3, M4)—Clean element
- 31. Battery—Top up
- 32. Distributor—Oil shaft bearing, auto advance, contact breaker pivot and cam
- 33. Magneto—Oil contact breaker pivot and cam

MONTHLY OR EVERY 200 HOURS

- 34. Engine sump (PM3, PM4)—Drain and refill
- 35. Engine oil filter (PM3, PM4)—Clean element
- 36. Steering box—Top up
- 37. Radiator—Drain, flush and refill
- 38. Air cleaner—Remove and clean gauze in petrol or paraffin
- 39. Carburettor—Clean filter

EVERY SIX MONTHS OR 500 HOURS

- 40. Engine oil filter—Renew element (Vokes No. B8648)

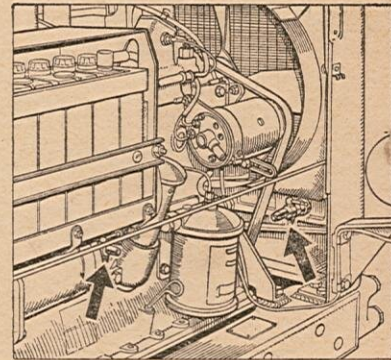
YEARLY OR EVERY 1,000 HOURS

- 41. Engine sump—Remove and clean. Clean oil intake strainer
- 42. Gearbox—Drain and refill
- 43. Hydraulic lift—Clean pump intake strainer
- 44. Dynamo—Refill lubricator with H.M.P. grease.

DRAINING POINTS

Taps for radiator and cylinder block are both on off side of tractor

| FILL-UP DATA | | | | |
|--|------------|-------|---------|----------|
| Engine sump | 14 pints | | | Litres 8 |
| Gearbox | 12 gallons | | | 54.5 |
| Steering box | 6 pints | | | 3.4 |
| Air cleaner | 1 pint | | | .6 |
| Cooling system | 30 pints | | | 17 |
| Fuel tank : main | 14 gallons | | | 63.6 |
| v.o. starting | 1½ gallons | | | 6.8 |
| | | Front | Rear | |
| Tyre pressures (Standard and optional sizes) | 9.00-10 | 44 lb | 11-36 | 12 lb |
| | 6.00-18 | 28 lb | 9.00-36 | 14 lb |
| | 6.00-19 | 28 lb | 14-30 | 20 lb |
| | 7.50-18 | 36 lb | | |



RECOMMENDED LUBRICANTS

| | S.A.E. No. | Esso | Shell | Vacuum | Wakefield's | Price's | Filtrate | Sternol | Duckham's |
|-----------------------------|------------|------------------|---------------------|--------------------------------|------------------------------------|-----------------------------|------------------------|---------------------|-----------------------|
| Engine | Above 32°F | Essolube 40 | Tractor Oil 40 | Mobiland Tractor Oil 640 | Agricastrol Medium | Energol Tractor Oil 40 | Farm Filtrate 40 | Sterntrac 40 | NOL Forty Commercial |
| | 32° to 0°F | Essolube 20 | Tractor Oil 20 | Mobiland Tractor Oil 620 | Agricastrol Light | Energol Tractor Oil 20 | Farm Filtrate 20 | Sterntrac 20 | NOL Twenty Commercial |
| | Above 32°F | Essolube 30 | Tractor Oil 30 | Mobiland Tractor Oil 630 | Agricastrol Medium | Energol Tractor Oil 30 | Farm Filtrate 30 | Sterntrac 30 | NOL Thirty Commercial |
| | 32° to 0°F | Essolube 20 | Tractor Oil 20 | Mobiland Tractor Oil 620 | Agricastrol Light | Energol Tractor Oil 20 | Farm Filtrate 20 | Sterntrac 20 | NOL Twenty Commercial |
| Transmission, Steering gear | 90 | Esso Gear Oil 90 | Tractor Gear Oil 90 | Mobiland Tractor Gear Oil 90 | Agricastrol Gear Oil (Light) | Energol Tractor Gear Oil 90 | Tractor Gear Oil 90 | Sterntrac G90 | Commadcol OG 90 |
| Grease gun | — | Esso Grease | Tractor Grease | Mobiland Tractor Grease (soft) | Agricastrol Tractor Grease (Light) | Energrease Tractor | HP Solidified Filtrate | Ambroline RB Grease | HBB Grease |