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No. 506/O.E.C.D.

REPORT ON TEST IN ACCORDANCE WITH O.E.C.D. TEST CODE FOR AGRICULTURAL TRACTORS

# FORD SUPER MAJOR DIESEL TRACTOR, MODEL 5000

*Manufactured by:* Ford Motor Co. Ltd,
Tractor Division, Basildon, Essex



*Date of Tests:* December 1965–January 1966
*Test No.:* R.66014/O.E.C.D.

*This report has been approved by the O.E.C.D. Coordinating Centre (C.N.E.E.M.A., France) as being in accordance with the O.E.C.D. Tractor Test Code*

*Date of Approval:* 7th June 1966 *Serial No.:* 112

**NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING**
WREST PARK SILSOE BEDFORD

This Bulletin is based on engineering tests in accordance with the O.E.C.D. Tractor Code. It does not contain an evaluation of the performance of the tractor on practical farm work

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## PART I

## SPECIFICATION OF TRACTOR

### Tractor

| | |
|---|---|
| Make: | Ford |
| Model: | Ford Super Major |
| Type: | 5000 |
| Serial No.: | B 0813413 |

### Engine

| | |
|---|---|
| Make: | Ford Motor Co. Ltd, type 5000, direct injection diesel engine, Serial No. RD—079977—J215 |
| Cylinders: | 4 cylinders, vertical, in-line, 4·2 in (106·7 mm) bore × 4·2 in (106·7 mm) stroke, capacity 232·8 in³ (3·81 l), compression ratio 16·5:1 (nominal). Monobloc construction, overhead valves |
| Rated speeds: | 2100 rev/min, governor setting—no load engine speed 2285–2335 rev/min |
| Fuel system: | Fuel—Diesel oil<br>Simms type P 4666/1 injection pump, Serial No. YM 28136; Simms type NL 413 injector nozzles. Manufacturer's production setting for injection pump 11·8–12·4 cm³ per element for 200 injections at 700 rev/min pump speed (test bench figures). Injection pressure 185–190 atm (191–196 kp/cm²), A.C. mechanical type VP 7950618 fuel feed pump, dual Simms parallel flow replaceable paper element fuel filters on pressure side of feed pump each with sediment bowl and water trap. Capacity of fuel tank 16·6 UK gal (75·5 l) |
| Governor: | Simms mechanical, incorporated in fuel injection pump. Governed range of engine speed 600–2335 rev/min |
| Air cleaner: | Burgess oil bath under hood forward of radiator, centrifugal pre-cleaner above hood, oil capacity 2 pt (1·14 l) |
| Lubricating system: | Forced feed from eccentric rotor type pump with metal strainer in sump. Ford replaceable element filter. SAE 10W Supplement I oil for first 600 hours, then SAE 20W Supplement I or Series III oil when fuel sulphur content is more than 1%; recommended oil change period 300 h; oil capacity 13·4 pt (7·6 l) including filter |
| Cooling system: | Water cooled, pressurized 7 lb/in² (0·49 kp/cm²), impeller assisted with 16 in (406 mm) dia, belt driven 4-blade fan, thermostat for temperature control, cooling water capacity 3·2 UKgal (14·5 l) |

### Transmission

| | |
|---|---|
| Clutch: | Borg and Beck, 12 in (305 mm) dia, single plate dry clutch, foot-pedal operated |
| Gearbox: | Own make, constant mesh type, 8 forward speeds and 2 reverse |
| Differential: | Crown wheel and pinion and differential with epicyclic reduction gear final drives, foot-pedal operated differential lock. Transmission oil capacities: gearbox 31·4 pt (17·8 l) SAE 80 EP oil, rear axle 54·6 pt (31·0 l) oil to Ford specification ESEN—M2 C86A |

| *Gear* | *Number of engine revolutions for one revolution of driving wheel* | *Theoretical travelling speed for 2100 rev/min rated speed of engine, mile/h (km/h)* |
|---|---|---|
| Forward 1 | 215·5 | 1·59 (2·56) |
| 2 | 173·6 | 1·98 (3·19) |
| 3 | 99·0 | 3·47 (5·58) |
| 4 | 72·8 | 4·72 (7·59) |
| 5 | 60·4 | 5·69 (9·16) |
| 6 | 48·8 | 7·04 (11·33) |
| 7 | 27·8 | 12·36 (19·89) |
| 8 | 20·5 | 16·76 (26·97) |
| Reverse low | 151·4 | 2·27 (3·65) |
| high | 42·4 | 8·10 (13·03) |

**Steering device** Recirculating ball type with single drag link

**Brakes** Hand-lever operated transmission brake; independent or combined foot-pedal operated oil immersed disc brakes on differential half shafts

**Wheels**

Steering wheels: Two at front. Tyres 7.50–16, 6-ply pneumatic. Track 52 in (1321 mm) by 4 in (102 mm) steps to 80 in (2032 mm), changed by extending front axle. Maximum permissible weight on each tyre: 1560 lb (708 kg) at 36 lb/in² (2·5 kp/cm²)

Driving wheels: Two at rear. Tyres 15–30, 6-ply pneumatic. Track 62 in (1575 mm) and 70 in (1778 mm), changed by reversing wheels. Maximum permissible weight on each tyre: 5320 lb (2413 kg) at 20 lb/in² (1·4 kp/cm²)

Wheelbase: 7 ft 3½ in (2223 mm)

**Belt pulley**

Location: Attachable to rear of tractor, main p.t.o. driven

Diameter × width: 11 in (279 mm) × 6½ in (165 mm)

Speeds: 1098 rev/min giving 3161 ft/min (16·06 m/s) linear speed at 2100 rev/min rated engine speed. 1076 rev/min giving 3100 ft/min (15·75 m/s) linear speed at 2059 rev/min engine speed

Direction of rotation: Clockwise viewed from left-hand side

**Power take-off**

Main: Hydraulically engaged proportional engine speed, 6 spline, 1⅜ in (34·9 mm) dia at rear of tractor

Height above ground: 26⅞ in (683 mm)

Speeds: 596 rev/min at 2100 rev/min rated engine speed
540 rev/min at 1902 rev/min engine speed
Independent of main clutch

DZN = ±10 4/min
= +30
−10

Direction of rotation: Clockwise viewed from tractor rear

**Power lift**

Own make, hydraulic, gear pump driven from power take-off shaft, independent of main and p.t.o. clutches, supplying oil from transmission at nominal pressure of 2500 lb/in² (176 kp/cm²) to ram cylinder and external tapping. Oil flow from external tapping at maximum horsepower delivered by hydraulic system, test figures: 4·75 UKgal/min (21·6 l/min) at 2200 lb/in² (155 kp/cm²) and 2100 rev/min rated engine speed, oil temperature 58 °C

Category II implement linkage, draught or position control with auxiliary service control and flow control device, maximum load liftable at end of lower links—test figures: through complete range—3600 lb (1633 kg); at top of lift range–4850 lb (2200 kg); manufacturer's recommended figure—2600 lb (1179 kg) at 24 in (610 mm) to rear of lower link balls. Radius of motion of lower links 34 in (864 mm)

**Drawbar**

Swinging drawbar, radius of swing $24\frac{7}{8}$ in (632 mm) and $30\frac{7}{8}$ in (784 mm), lateral adjustment $13\frac{1}{4}$ in (337 mm) and 19 in (483 mm), vertical heights to centre of clevis $15\frac{1}{4}$ in (387 mm), $15\frac{1}{2}$ in (394 mm), 19 in (483 mm) and $19\frac{1}{4}$ in (489 mm). Distance behind rear axle $24\frac{7}{8}$ in (632 mm) and $30\frac{7}{8}$ in (784 mm)

**Hitch**

None fitted

**Electrical equipment**

| | |
|---|---|
| Voltage: | 12, negative earth |
| Generator: | Lucas type C40A |
| Battery: | Ford type C5NN 10655C, lead acid, capacity 128 Ah |
| Starting device: | Ford type C5NF 11001-A solenoid engaged starter motor, operable only when the gear selector lever is in neutral |

**Overall dimensions**

| | |
|---|---|
| Overall length: | 13 ft $1\frac{1}{2}$ in (4·00 m) as tested with 7 front weights<br>11 ft 11 in (3·63 m) as tested without ballast |
| Overall width: | 10 ft 3 in (3·12 m) at 62 in (1575 mm) track to outside of wheel weights, 15 per wheel<br>6 ft 9 in (2·06 m) at 62 in (1575 mm) track, no ballast weights |
| Overall height: | 7 ft $8\frac{1}{2}$ in (2·35 m) to top of exhaust pipe<br>5 ft 10 in (1·78 m) to top of steering wheel |
| Minimum ground clearance: | $15\frac{1}{2}$ in (394 mm) to underside of drawbar frame |

**Weights**

With full fuel tank, oil, cooling water, no driver

| | *Without additional weight, lb (kg)* | *With maximum additional weight, lb (kg)* |
|---|---|---|
| On front wheels | 2023 (918) | 2896 (1314) |
| On rear wheels | 3529 (1601) | 8669 (3932) |
| Total | 5552 (2519) | 11 565 (5246) |

**Special remarks**

Manually operated excess fuel device fitted for cold starting

## PART II
## LABORATORY TESTS

1. Compulsory tests: Power take-off test
   Date and location of tests: 13th–14th December 1965, N.I.A.E., Silsoe, Bedford, U.K.
   Type of dynamometer: Water brake, Heenan and Froude
   Fuel: Diesel oil, density 0·837 at 60 °F (15·6 °C), Cetane No. 54
   Engine oil: SAE 10W Supplement I
   Transmission oil: Gearbox SAE 80 EP
   Final drive, Ford specification ESEN—M2C86A

| Horse-power (Metric hp) | Speeds, rev/min | | Equivalent crankshaft torque, lb ft (kp m) | Fuel consumption, | | | Temperature, °F (°C) | | | Atmos. conditions | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Engine | P.t.o. | | UKgal/h (l/h) | lb/hp h (g/metric hp h) | hp h/UKgal (metric hp h/l) | Coolant | Oil | Fuel | Temp., °F (°C) | Press., inHg (mmHg) |
| A. Maximum power | | | | | | | | | | | |
| 56·9 (57·7) | 2103 | 597 | 142·1 (19·65) | 3·03 (13·77) | 0·446 (199) | 18·8 (4·19) | 191 (88) | 212 (100) | 75 (24) | 61 (16) | 30·04 (763) |
| B. Power at standard p.t.o. speed (540 rev/min) | | | | | | | | | | | |
| 53·4 (54·1) | 1902 | 540 | 147·4 (20·39) | 2·70 (12·27) | 0·423 (189) | 19·8 (4·42) | 193 (89) | 208 (98) | 86 (30) | 61 (16) | 29·75 (756) |
| C. Power at maximum torque | | | | | | | | | | | |
| 41·9 (42·5) | 1340 | 380 | 164·0 (22·68) | 2·02 (9·18) | 0·404 (181) | 20·7 (4·62) | 195 (91) | 210 (99) | 78 (26) | 60 (16) | 30·04 (763) |
| D. Power at rated speed | | | | | | | | | | | |
| 55·9 (57·7) | 2100 | 596 | 142·3 (19·68) | 3·03 (13·77) | 0·446 (199) | 18·8 (4·19) | 191 (88) | 212 (100) | 75 (24) | 61 (16) | 30·04 (763) |

No load, maximum engine speed: 2303 rev/min

2. Supplementary tests: Engine test (in installed condition)
   Date and location of tests: 21st December 1965, N.I.A.E., Silsoe, Bedford, U.K.
   Type of dynamometer: Water brake, Heenan and Froude
   Fuel: Diesel oil, density 0·837 at 60 °F (15·6 °C), Cetane No. 54
   Engine oil: SAE 10W Supplement I

| Horse-power (Metric hp) | Speed, rev/min | Crank-shaft torque, lb ft (kp m) | Fuel consumption, | | | Temperature, °F (°C) | | | Atmos. conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | UKgal/h (l/h) | lb/hp h (g/metric hp h) | hp h/UKgal (metric hp h/l) | Coolant | Oil | Fuel | Temp., °F (°C) | Press., inHg (mmHg) |
| A. Maximum power | | | | | | | | | | |
| 60·6 (61·4) | 2100 | 151·4 (20·94) | 3·06 (13·91) | 0·423 (189) | 19·8 (4·42) | 191 (88) | 206 (97) | 65 (18) | 60 (16) | 30·10 (765) |
| B. Power at standard p.t.o. speed (540 rev/min) | | | | | | | | | | |
| 58·2 (59·0) | 1902 | 160·7 (22·22) | 2·80 (12·73) | 0·403 (180) | 20·8 (4·64) | 193 (89) | 208 (98) | 68 (20) | 59 (15) | 30·10 (765) |
| C. Power at maximum torque | | | | | | | | | | |
| 42·0 (42·6) | 1280 | 172·3 (23·83) | 1·91 (8·68) | 0·381 (170) | 22·0 (4·91) | 194 (90) | 201 (94) | 68 (20) | 59 (15) | 30·10 (765) |
| D. Power at rated speed | | | | | | | | | | |
| 60·6 (61·4) | 2100 | 151·4 (20·94) | 3·06 (13·91) | 0·423 (189) | 19·8 (4·42) | 191 (88) | 206 (97) | 65 (18) | 60 (16) | 30·10 (765) |

No load, maximum engine speed: 2285 rev/min

3. Supplementary tests: Belt test
Date and location of tests: 14th December 1965, N.I.A.E., Silsoe, Bedford, U.K.
Type of dynamometer: Electrical swinging frame
Fuel: Diesel oil, density 0·837 at 60 °F (15·6 °C), Cetane No. 54
Engine oil: SAE 10W Supplement I
Transmission oil: Gearbox, SAE 80 EP
Final drive, Ford specification ESEN—M2C86A

| *Horse-power (Metric hp)* | *Speeds* | | *Equivalent crankshaft torque, lb ft (kp m)* | *Fuel consumption,* | | | *Temperature, °F (°C)* | | | *Atmos. conditions* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Engine, rev/min* | *Belt, ft/min (m/s)* | | *UKgal/h (l/h)* | *lb/hp h (g/metric hp h)* | *hp h/ UKgal (metric hp h/l)* | *Coolant* | *Oil* | *Fuel* | *Temp., °F (°C)* | *Press., inHg (mmHg)* |
| A. Maximum power | | | | | | | | | | | |
| 54·6 (55·4) | 2143 | 3226 (16·39) | 133·8 (18·50) | 3·04 (13·82) | 0·467 (209) | 17·9 (3·99) | 190 (88) | 210 (99) | 65 (18) | 60 (16) | 30·09 (764) |
| B. Power at standard belt speed (3100 ft/min [15·75 m/s]) | | | | | | | | | | | |
| 54·3 (55·1) | 2059 | 3100 (15·75) | 138·5 (19·15) | 2·96 (13·46) | 0·456 (204) | 18·3 (4·08) | 191 (88) | 212 (100) | 67 (19) | 63 (17) | 30·09 (764) |
| C. Power at maximum torque | | | | | | | | | | | |
| 39·7 (40·3) | 1300 | 1957 (9·94) | 160·4 (22·18) | 1·96 (8·91) | 0·412 (184) | 20·3 (4·53) | 193 (89) | 200 (93) | 70 (21) | 59 (15) | 30·09 (764) |
| D. Power at rated speed | | | | | | | | | | | |
| 54·4 (55·2) | 2100 | 3161 (16·06) | 136·1 (18·82) | 3·01 (13·68) | 0·462 (207) | 18·1 (4·04) | 191 (88) | 212 (100) | 66 (19) | 62 (17) | 30·09 (764) |
| No load maximum engine speed: 2315 rev/min | | | | | | | | | | | |

## PART III

## DRAWBAR TESTS ON ARTIFICIAL TRACK

Date of tests: 10th–14th January 1966
Type of track: Tarmacadam
Position of governor control lever: Fully open, giving no-load engine speed of 2285–2335 rev/min
Type of tyre: Rear—Goodyear, Traction Sure Grip, straight bar, open centre, 15–30, 6-ply pneumatic
Front—Goodyear, Super Rib, 7·50–16, 6-ply pneumatic
Fuel: Diesel oil, density 0·837 at 60 °F (15·6 °C), Cetane No. 54
Engine oil: SAE 10W Supplement I
Transmission oil: Gearbox, SAE 80 EP; Final drive, Ford specification ESEN—M2C86A

A. **Tests with maximum additional weight**
**Weight of tractor, without driver:**
Weight without ballast: Front—2023 lb (918 kg)
Rear—3529 lb (1601 kg)
Ballast: Front: Weights, 1 per wheel—181 lb (82 kg)
Water—nil
Rear: Weights, 15 per wheel—3187 lb (1446 kg)
Calcium chloride solution—2076 lb (942 kg)
Additional: 7 front frame weights—569 lb (258 kg)

Weight with full ballast: Front—2896 lb (1314 kg)
Rear—8669 lb (3932 kg)
Total—11 565 lb (5246 kg)

Tyre pressure: Front—32 lb/in² (2·25 kp/cm²)
Rear—16 lb/in² (1·12 kp/cm²)

Height of drawbar above ground: 18 in (457 mm)

(1) *Maximum powers and pulls*

| Gear | Maximum powers | | | | | | Air temp., °F (°C) | Atmos. press., inHg (mmHg) | Maximum pulls | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Horse-power (Metric hp) | Corresponding pull, lb (kp) | Wheel slip, % | Engine speed, rev/min | Speed, mile/h (km/h) | Engine coolant temp., °F (°C) | | | Pull, lb (kp) | Reason for stall |
| 1 | 40·3 (40·9) | 10 350 (4695) | 16·9 | 2247 | 1·46 (2·35) | 186 (86) | 33 (1) | 29·94 (760) | 11 250 (5103) | Wheelspin |
| 2 | 47·7 (48·4) | 9900 (4491) | 14·1 | 2142 | 1·81 (2·91) | 186 (86) | 34 (1) | 30·23 (768) | 11 250 (5103) | Wheelspin |
| 3 | 52·4 (53·1) | 5700 (2586) | 5·4 | 2177 | 3·45 (5·55) | 185 (86) | 35 (2) | 29·87 (759) | 6800 (3084) | Engine stall |
| 4 | 51·3 (52·0) | 4050 (1837) | 3·8 | 2141 | 4·75 (7·64) | 186 (86) | 34 (1) | 29·87 (759) | 4950 (2245) | Engine stall |
| 5 | 52·4 (53·1) | 3375 (1531) | 3·1 | 2158 | 5·82 (9·36) | 185 (85) | 34 (1) | 29·87 (759) | 4050 (1837) | Engine stall |
| 6 | 50·5 (51·2) | 2625 (1191) | 2·5 | 2146 | 7·21 (11·60) | 180 (82) | 32 (0) | 29·94 (760) | 3150 (1429) | Engine stall |

(2) *Fuel consumption*

| Gear | Optimum fuel consumption | | | Range of pull, lb (kp) over which specific fuel consumption does not exceed optimum consumption by more than 10% |
|---|---|---|---|---|
| | Specific fuel consumption, lb/drawbar hp h (g/metric drawbar hp h) | Drawbar hp h/UKgal (metric drawbar hp h/l) | Corresponding pull, lb (kp) | |
| 1 | 0·610 (273) | 13·7 (3·06) | 9200 (4173) | 5900 – 10 850 (2676) (4922) |
| 2 | 0·589 (263) | 14·2 (3·17) | 8200 (3720) | 5400 – > 10 600 (2449) (4808) |
| 3 | 0·472 (211) | 17·7 (3·95) | 6700 (3039) | 5910 – 6800 M.S.P. (2681) (3084) |
| 4 | 0·495 (221) | 16·9 (3·77) | 4750 (2154) | 4000 – 4950 M.S.P. (1814) (2245) |
| 5 | 0·504 (225) | 16·6 (3·70) | 4000 (1814) | 3270 – 4050 M.S.P. (1483) (1837) |
| 6 | 0·500 (224) | 16·7 (3·73) | 3000 (1361) | 2690 – 3150 M.S.P. (1220) (1429) |

B. **Tests without ballast**

**Weight of tractor without driver:**

Weight without ballast: Front—2023 lb (918 kg)
Rear—3529 lb (1601 kg)
Total—5552 lb (2519 kg)

Tyre pressure: Front—20 lb/in² (1·4 kp/cm²)
Rear—12 lb/in² (0·8 kp/cm²)

Height of drawbar above ground: 18 in (457 mm)

(1) ***Maximum powers and pulls***

| Gear | *Maximum powers* | | | | | | *Air temp., °F (°C)* | *Atmos. press., inHg (mmHg)* | *Maximum pulls* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Horse-power (Metric hp)* | *Corres-ponding pull, lb (kp)* | *Wheel slip, %* | *Engine speed, rev/min* | *Speed, mile/h (km/h)* | *Engine coolant temp., °F (°C)* | | | *Pull, lb (kp)* | *Reason for stall* |
| 3 | 46·9 (47·6) | 5275 (2393) | 13·5 | 2235 | 3·33 (5·36) | 185 (85) | 29 (−2) | 30·32 (770) | 5700 (2586) | Wheelspin |
| 4 | 52·9 (53·6) | 4150 (1882) | 6·7 | 2206 | 4·78 (7·69) | 184 (84) | 30 (−1) | 30·32 (770) | 5050 (2291) | Engine stall |
| 5 | 54·1 (54·9) | 3540 (1606) | 5·1 | 2165 | 5·73 (9·22) | 185 (85) | 34 (1) | 30·32 (770) | 4250 (1928) | Engine stall |
| 6 | 53·9 (54·7) | 2800 (1270) | 3·6 | 2137 | 7·22 (11·62) | 185 (85) | 34 (1) | 30·32 (770) | 3350 (1520) | Engine stall |

## PART IV

1. **Location of centre of gravity**

| | *Tractor unballasted* |
|---|---|
| Height above ground | 33·6 in (853 mm) |
| Distance forward from the vertical plane containing the axis of the rear wheels | 31·0 in (787 mm) |
| Distance from the median plane parallel to the longitudinal axis of the tractor bisecting the track | 0 |

2. **Turning space and turning radius**

Wheel equipment: As for drawbar test without ballast

Wheel track: Front—52 in (1321 mm)
Rear—62 in (1575 mm)

| | *With brakes* | | *Without brakes* | |
|---|---|---|---|---|
| | *Right-hand* | *Left-hand* | *Right-hand* | *Left-hand* |
| Radius of turning space | 11 ft 1 in (3·38 m) | 10 ft 10 in (3·30 m) | 12 ft 8 in (3·86 m) | 12 ft 1½ in (3·70 m) |
| Turning radius | 10 ft 8 in (3·25 m) | 10 ft 5 in (3·18 m) | 12 ft 3 in (3·73 m) | 11 ft 8½ in (3·57 m) |

## PART V

1. **Repairs and adjustments during tests:** During the test of the engine in the installed condition the injectors in Cylinders 2 and 3 were changed to rectify a small loss of power

2. **Remarks:** None

*Test Engineer:* D. W. SMITH

*Head of Tractor and Drier Performance Department:* P. H. BAILEY

*Date:* 5th May 1966

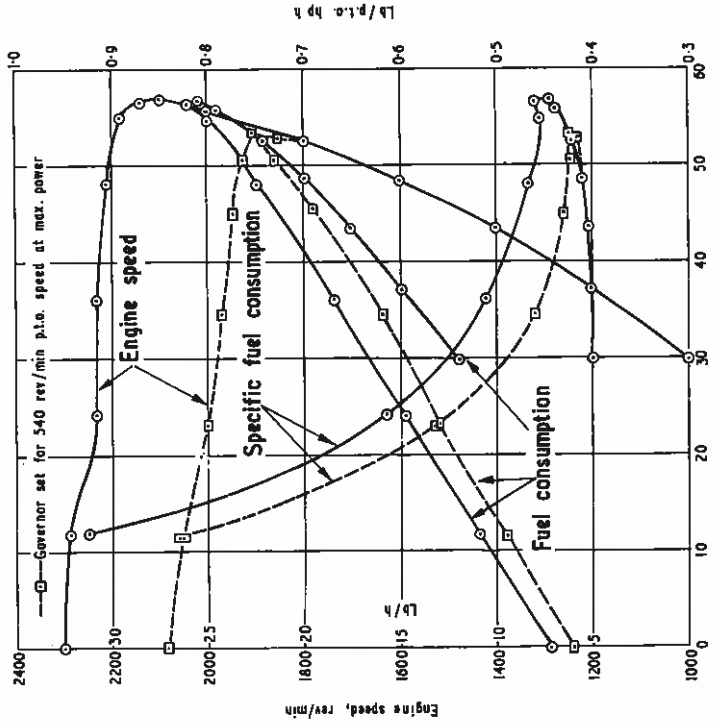



FIG. 2. Power take-off test

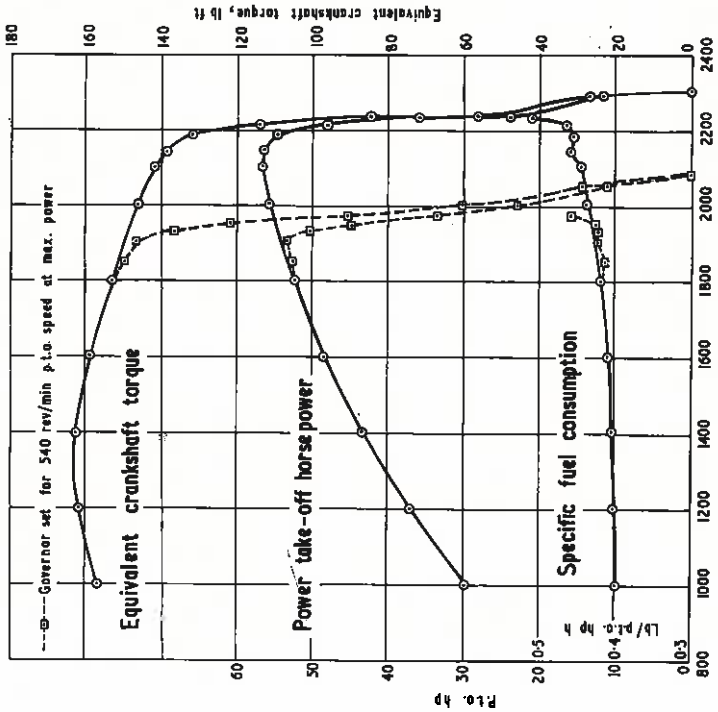



FIG. 1. Power take-off test

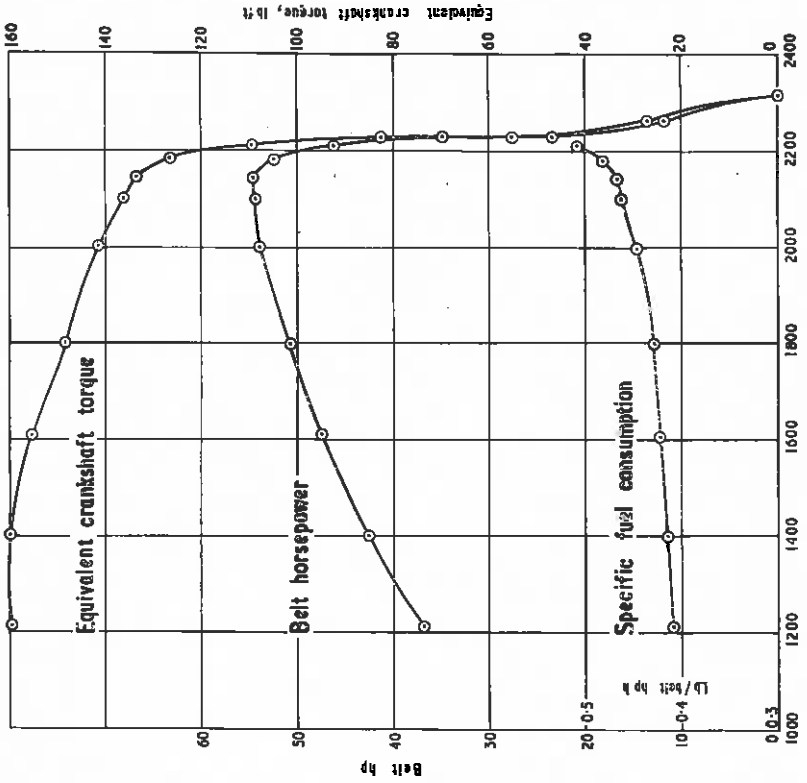



FIG. 4. Belt test

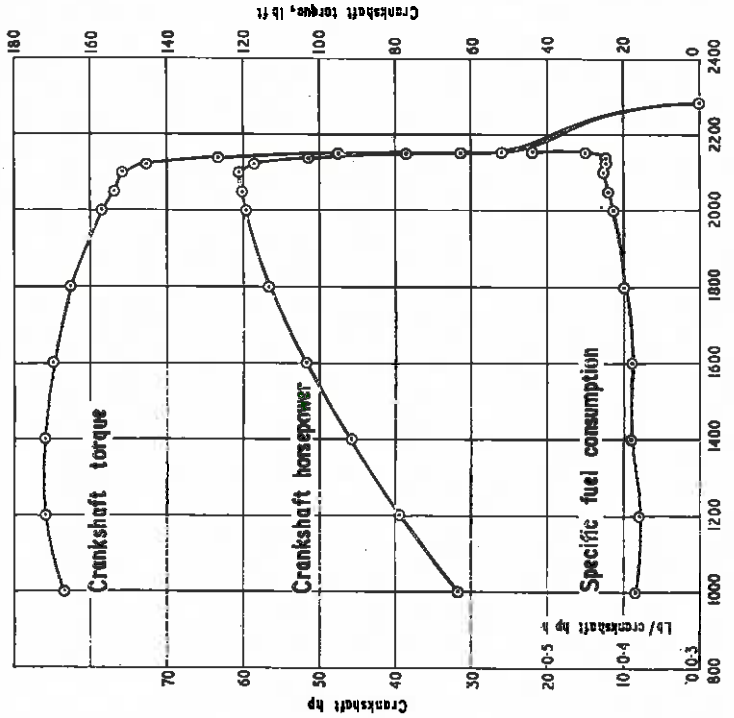



FIG. 3. Engine test

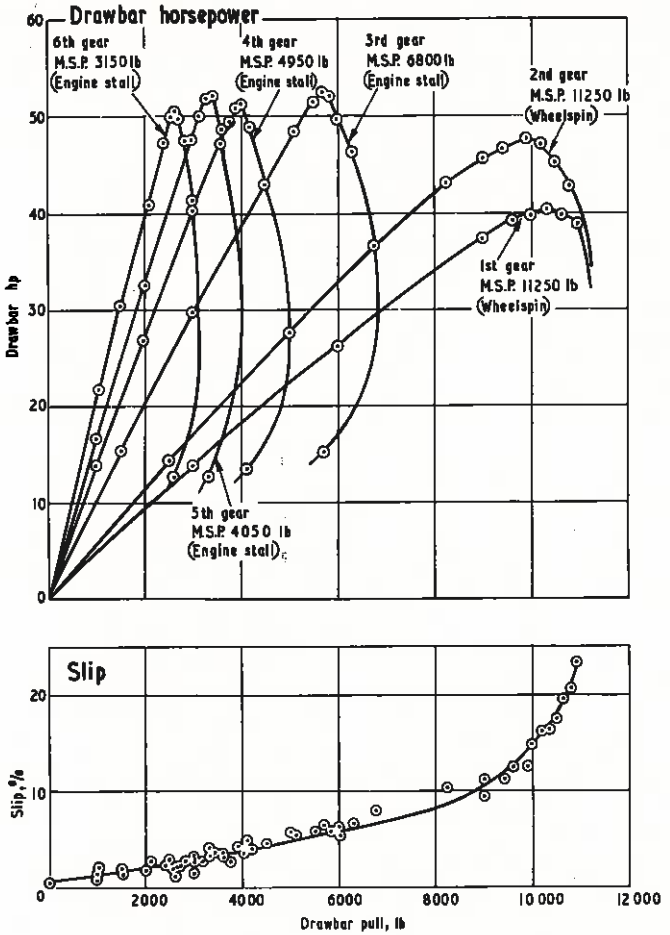



FIG. 5. Drawbar test on tarmacadam, with ballast

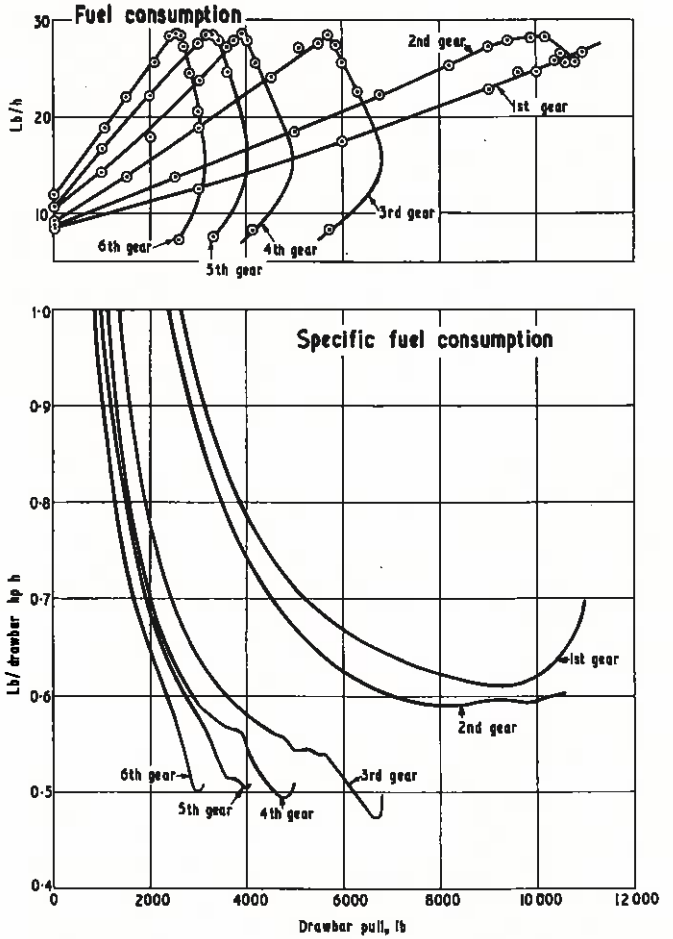



FIG. 6. Drawbar test on tarmacadam, with ballast

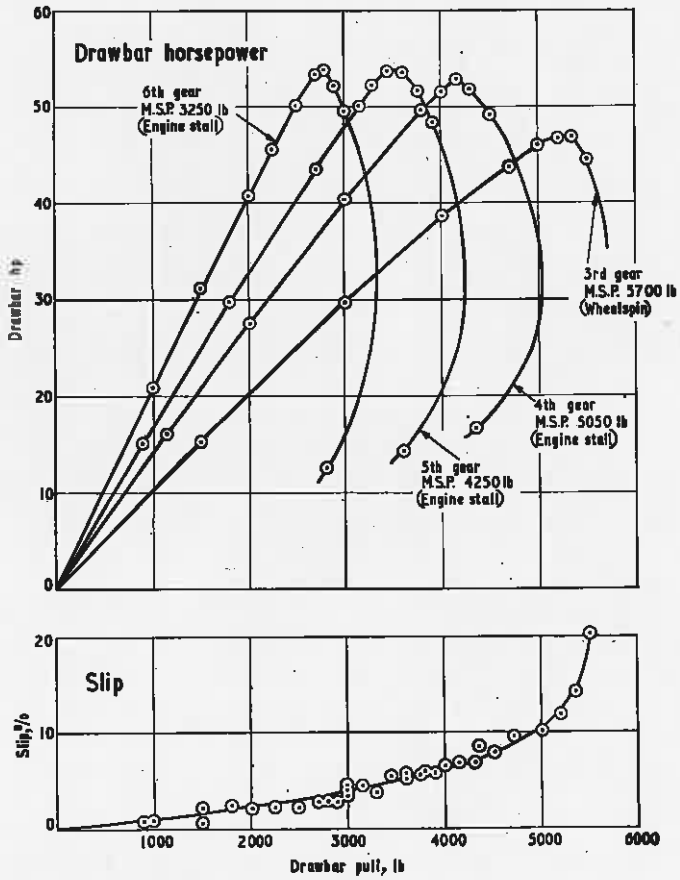



FIG. 7. Drawbar test on tarmacadam, without ballast

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