Report 611/O.E.C.D.
December 1969

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

FORD MODEL 5000 TRACTOR

Manufactured by: Ford Motor Co. Ltd,
Basildon, Essex

Test No.: R.69/5515/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: 19th January 1970 *Serial No.:* 298

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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SPECIFICATION OF TRACTOR

Manufacturer:	Ford Motor Co.Ltd, Basildon, Essex
Submitted for test by:	The manufacturer
Selected by:	The manufacturer, with the agreement of the testing station
Place of running-in:	Basildon
Duration of running-in:	150 hours

Tractor

Make:	Ford Motor Co.Ltd, Basildon, Essex
Model:	5000
Type:	Four wheel, rear wheel driven
Serial No.:	B.867267

Engine

Make: Ford Motor Co.Ltd Model: 5000
Type: 4-stroke, direct injection diesel Serial No.: E.045052

Cylinders:	4 cylinders, vertical, in-line, 4·4 in (111·8 mm) bore x 4·2 in (106·7 mm) stroke, capacity 255·4 in^3 (4·185 l), compression ratio 16·5:1 (nominal); monobloc construction, overhead valves
Fuel system:	AC model VP 7950618 mechanical type fuel pump with hand primer; two Simms paper element fuel filters in series, each with sediment bowl and water trap on pressure side of feed pump; capacity of fuel tank 16·6 UKgal (75·5 l); Simms type P4862 injection pump, Serial No. YM 105143; manufacturer's production setting for injection pump: 14·5 - 15·3 cm^3 for 200 injections at 900 rev/min pump speed (test bench figures); C.A.V. type BDLL - 140S-6422 injector nozzles, injection pressure 185-190 atm (191-196 kg/cm^2)
Governor:	Simms mechanical, incorporated in fuel injection pump, governed range of engine speed 600 to 2375 rev/min, rated engine speed 2100 rev/min

Air cleaner:	Burgess oil bath under hood forward of radiator, centrifugal pre-cleaner above hood, oil capacity 2 pt (1·14 l)
Lubrication system:	Forced feed from eccentric rotor type pump with metal strainer in sump; FoMoCo replaceable element filter, total oil capacity 16·74 pt (9·5 l), recommended oil change period 300 h with Series III oil and 150 h with Supplement I oil
Cooling system:	Water cooled, pressurized at 7 lb/in² (0·49 kg/cm²), impeller assisted with 16 in (406 mm) dia, belt driven 4 blade fan, thermostat for temperature control, cooling water capacity 25·5 pt (14·5 l)
Starting system:	Electrical, 12V Lucas type M45G solenoid engaged starter motor, operable only when high-low gear selector is in neutral position, manually operated excess fuel device on fuel injection pump for cold starting
Electrical system	Voltage: 12, negative earth Generator: Lucas type C40T Battery: FoMoCo type C5NN 10655-6, lead acid, capacity 128 Ah

Transmission

Clutch:	Borg and Beck single plate dry clutch, 12 in (305 mm) dia, pedal operated
Gearbox:	Own make, constant mesh type, 8 forward and 2 reverse
Rear axle and final drive:	Own make, crown wheel and pinion with differential and epicyclic reduction gear final drives, pedal operated differential lock
Oil capacities:	Gearbox 18 pt (10·2 l) SAE 80 EP oil, final drives 58 pt (33·0 l) oil to Ford specification ESEN-M2C86A; recommended oil change period 1200 h

Gear	Number of engine revolutions for 1 revolution of driving wheel	*Nominal 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)

*Calculated with tyre rolling radius of $27\frac{1}{2}$ in (699 mm)

Power take-off

Hydraulically engaged, 6-spline, $1\frac{3}{8}$ in (34·9 mm) dia, at rear of tractor, height above ground $26\frac{3}{8}$ in (670 mm); proportional engine speed giving 665 rev/min at 2100 rev/min rated engine speed, 540 rev/min (standard p.to. speed) at 1706 rev/min engine speed; independent of main clutch, direction of rotation clockwise viewed from tractor rear

Belt pulley

Available but not fitted for test

Power lift

Own make, hydraulic, gear pump driven from p.t.o. drive shaft, independent of main and p.t.o. clutches, oil from transmission supplied to single acting ram cylinder and external tapping; Category 2 implement linkage with controls for draught or position with auxiliary service control and flow control device, vertical lift movement above ground $11\frac{3}{8}$ in (289 mm) to $37\frac{3}{8}$ in (949 mm)

Drawbar

Linkage drawbar:

Drawbar fixed on lower links with central hole and 5 holes spaced at 2 in (51 mm) intervals on each side of centre line, vertical adjustment from 12 in (305 mm) to $25\frac{3}{4}$ in (654 mm) above ground level, changed by adjustable stay links, drawbar holes to take $\frac{3}{4}$ in (19 mm) dia pin, distance from rear axle 38 7/16 in (976 mm) to the rear and from p.t.o. $21\frac{1}{4}$ in (540 mm) to rear, with drawbar in the horizontal position

Swinging drawbar: Radius of swing 25 in (635 mm) and 31 in (787 mm), lateral adjustment $13\frac{1}{4}$ in (337 mm) and $18\frac{1}{4}$ in (464 mm), vertical heights to centre of clevis, $14\frac{1}{4}$ in (362 mm) to $18\frac{3}{8}$ in (466 mm), drawbar hole to take 1 in (25 mm) dia pin, distance behind rear axle 25 in (635 mm) and 31 in (787 mm), position relative to p.t.o. $8\frac{1}{8}$ in (206 mm) and $14\frac{1}{8}$ in (359 mm) to rear

Hitch: None fitted

Steering: Burman recirculating ball type with single drag link

Brakes: Oil immersed disc type on differential half-shafts, independent or combined pedal operated, hand lever with ratchet operating both brakes for parking

Wheels

Steering wheels: Two at front, Goodyear Super Rib 7·50 - 16 tyres, 6-ply rating, maximum permissible weight on each tyre, 1560 lb (708 kg) at 36 lb/in² (2·5 kg/cm²), track width 52 in (1321 mm) by 4 in (102 mm) steps to 80 in (2032 mm) changed by extending front axle and reversing wheels

Driving wheels: Two at rear, Goodyear Traction Sure Grip 18·4/15-30 tyres, 6-ply rating, maximum permissible weight on each tyre 4650 lb (2109 kg) at 16 lb/in² (1·1 kg/cm²), track width 60 in (1524 mm) by 4 in (102 mm) steps to 80 in (2032 mm) changed by reversing wheel centres and offset lugs on rims

Wheelbase: 7 ft $3\frac{1}{2}$ in (2223 mm)

Tractor and ballast weights (without driver but with tanks full)

Weight without ballast	Front:	1995 lb	(905 kg)
	Rear:	3563 lb	(1616 kg)
	Total:	5558 lb	(2521 kg)
Ballast	Front:	Weights - 1 per wheel, total 180 lb (82 kg)	
	Rear:	Weights - 12 per wheel, total 1702 lb (772 kg)	
		Liquid - 1958 lb (888 kg)	
		Additional: 2 front weights - total 136 lb (62 kg)	
Weight with full ballast	Front:	2348 lb	(1065 kg)
	Rear:	7186 lb	(3260 kg)
	Total:	9534 lb	(4325 kg)

Seat — Bostrom, upholstered combined cushion and back rest, parallelogram linkage with steel torsion bar suspension adjustable for driver's weight; range of adjustment 2 in (51 mm) fore and aft

Number of grease points

Whole tractor: 8

Overall dimensions

Overall length: 11 ft 5¾ in (3·50 m) without ballast weights
11 ft 7⅜ in (3·54 m) with front weights fitted

Overall width: 6 ft 11 in (2·11 m) at 64 in (1626 mm) track without ballast weights
8 ft 9½ in (2·68 m) at 64 in (1626 mm) track with ballast weights

Overall height: 69½ in (1765 mm) to top of steering wheel
95½ in (2426 mm) to top of exhaust pipe

Minimum ground clearance: 14¾ in (375 mm) to underside of drawbar frame

Lighting

	Height above ground of centre, in	(cm)	Size, in	(cm)	Distance from outside edge of tractor, at 64 in (1626 mm) wheel track, to centre in	(cm)
Headlights	38½	(97·8)	4	(10·2) dia	28½	(72·4)
Side lights	58⅜	(148·3)	2	(5·1) dia	17¼	(43·8)
Rear lights	58½	(148·5)	3¾ x 2	(9·5) x (5·1)	19	(48·3)
Reflectors	56⅝	(143·8)	3¾ x 1¾	(9·5) x (4·4)	19	(48·3)

Unrestricted beam angle of headlight in plan view 66°

FUELS AND LUBRICANTS USED IN TESTS

Fuel: Diesel oil, specific gravity 0·8295 at 60°F (15·6°C), Cetane No. 53, to Class A, B.S.2869:1957

Engine oil: Series III, SAE 20W

Gearbox oil: SAE 80 EP

Final drive oil: Ford Specification ESEN-M2C86A

COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 28th July 1969; N.I.A.E., Silsoe, Bedford, U.K.

Type of dynamometer: Water brake, Heenan and Froude

Horsepower (Metric hp)	Speeds, rev/min		Fuel consumption,		
	Engine	P.t.o.	UKgal/h (l/h)	lb/hp h (g/metric hp h)	hp h/UKgal (metric hp h/l)
Maximum power - 2 hour test					
68·7 (69·7)	2226	704	3·72 (16·91)	0·449 (201)	18·5 (4·13)
Standard p.t.o. speed (540 rev/min)					
58·9 (59·7)	1706	540	3·02 (13·73)	0·425 (190)	19·5 (4·35)
Standard belt speed of 3100 ft/min (945 m/min)					
		Not applicable			
Speed recommended by the manufacturer for drawbar work					
67·3 (68·2)	2100	665	3·58 (16·27)	0·442 (198)	18·8 (4·19)
Fuel consumption at part loads					
60·1 (60·9)	2292	725	3·12 (14·18)	0·430 (192)	19·3 (4·31)
0	2370	750	0·89 (4·05)	-	-
30·7 (31·1)	2340	741	1·89 (8·59)	0·510 (228)	16·3 (3·64)
68·7 (69·7)	2226	704	3·72 (16·91)	0·449 (201)	18·5 (4·13)
15·5 (15·7)	2370	750	1·34 (6·09)	0·715 (320)	11·6 (2·59)
45·5 (46·1)	2313	732	2·48 (11·27)	0·452 (202)	18·3 (4·08)

No load, maximum engine speed: 2370 rev/min

Equivalent crankshaft torque at maximum power: 162·1 lb ft (22·4 kg m)

Maximum equivalent crankshaft torque: 183·1 lb ft (25·3 kg m) at 1520 rev/min engine speed

Mean atmospheric conditions: temperature 71°F (22°C)
pressure 29·80 in Hg (757 mm Hg)
relative humidity 81%

Maximum temperature: coolant 203°F (95°C)
engine oil 242°F (117°C)
fuel 100°F (38°C)

2. DRAWBAR PERFORMANCE

Date of tests: 14th August - 3rd September 1969 Type of track: Concrete Height of drawbar above ground: 16 in (406 mm)

Gear	Horse-power (metric hp)	Drawbar pull, lb (kg)	Speed, mile/h (km/h)	Engine speed, rev/min	Wheel-slip, %	Specific fuel consumption, lb/drawbar hp h (g/metric drawbar hp h)	drawbar hp h/ UKgal (metric drawbar hp h/l)	Temperature, °F (°C) Coolant	Fuel	Engine oil	Atmospheric conditions Temperature, °F (°C)	Relative humidity, %	Pressure inHg (mmHg)
(i)	Maximum power (ballasted)												
1	*36·3 (36·8)	8900 (4037)	1·53 (2·46)	2326	15·0	0·609 (272)	13·6 (3·03)	173 (78)	68 (20)	179 (82)	60 (16)	78	29·86 (758)
2	*45·1 (45·7)	8900 (4037)	1·90 (3·06)	2330	15·0	0·599 (268)	13·8 (3·08)	172 (78)	72 (22)	177 (81)	60 (16)	78	29·73 (755)
3	57·6 (58·4)	6150 (2790)	3·51 (5·65)	2276	8·3	0·564 (252)	14·7 (3·28)	180 (82)	79 (26)	187 (86)	68 (20)	76	30·08 (764)
4	58·7 (59·5)	4550 (2064)	4·84 (7·79)	2240	5·8	0·566 (253)	14·7 (3·28)	173 (78)	83 (28)	193 (89)	63 (17)	89	29·68 (754)
5	60·3 (61·1)	3850 (1746)	5·87 (9·44)	2223	4·9	0·548 (245)	15·2 (3·39)	187 (86)	97 (36)	210 (99)	74 (23)	58	29·69 (754)
6	58·7 (59·5)	3000 (1361)	7·34 (11·81)	2235	3·8	0·564 (252)	14·7 (3·28)	176 (80)	81 (27)	181 (83)	66 (19)	75	29·69 (754)
(ii)	Five hour test at 75% of pull at maximum power												
4	45·8 (46·4)	3410 (1547)	5·04 (8·11)	2299	4·3	0·565 (253)	14·7 (3·28)	176 (80)	-	216 (102)	68 (20)	80	30·00 (762)
(iii)	+Five hour test at pull corresponding to 15% wheelslip in test (i)												
2	-	8900 (4037)	2·0 (3·22)	-	-	-	-	175 (79)	-	213 (101)	64 (18)	90	30·01 (762)
(iv)	Maximum power (unballasted)												
2	*29·8 (30·2)	5700 (2586)	1·96 (3·15)	2320	15·0	-	-	172 (78)	-	197 (92)	65 (18)	85	30·05 (763)
3	*51·3 (52·0)	5700 (2586)	3·38 (5·44)	2295	15·0	-	-	199 (93)	-	185 (85)	65 (18)	85	30·05 (763)
4	61·7 (62·6)	4850 (2200)	4·77 (7·67)	2287	10·0	-	-	177 (81)	-	192 (89)	59 (15)	83	30·05 (763)
5	62·7 (63·6)	4050 (1837)	5·81 (9·35)	2237	7·4	-	-	174 (79)	-	187 (86)	65 (18)	70	30·10 (765)
6	62·9 (63·8)	3150 (1429)	7·49 (12·05)	2270	5·0	-	-	181 (83)	-	194 (90)	68 (20)	71	30·10 (765)

Total oil consumption during ten hours duration of Tests (ii) and (iii) 0·055 lb/h (24·9 g/h)

*Maximum power available at 15% wheelslip

+Test (iii) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance

3 and 4. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification, without ballast

Track of wheels: Front - 52 in (1321 mm)
Rear - 64 in (1626 mm)

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space	10 ft 8½ in (3·26 m)	10 ft 10 in (3·30 m)	11 ft 11 in (3·63 m)	12 ft 2½ in (3·72 m)
Radius of turning circle	10 ft 4½ in (3·16 m)	10 ft 6 in (3·20 m)	11 ft 7 in (3·53 m)	11 ft 10½ in (3·62 m)

5. LOCATION OF CENTRE OF GRAVITY

Height above ground	34·6 in (879 mm)
Distance forward from the vertical plane containing the axis of the rear wheels	31·2 in (792 mm)
Distance from the median plane of the tractor	0

6. BRAKING

Date of tests: **24th October and 3rd November 1969**

Type of track: Concrete

Cold brakes

	Tractor without ballast	Tractor ballasted
Travelling speed of tractor, mile/h (km/h)	15·5 (25·0)	15·5 (25·0)
Maximum deceleration, ft/s² (m/s²)	18·6 (5·7)	21·4 (6·5)
Stopping distance, ft (m)	23·3 (7·1)	22·0 (6·7)
Force on brake pedal, lb (kg)	80 (36)	150 (68)

Brake fade characteristics (hot tests)

Maximum deceleration hot/maximum deceleration cold x 100: **100%**

Stopping distance cold/stopping distance hot x 100: **100%**

Force on pedal cold/force on pedal hot x 100: **100%**

Efficiency of hand brake: Satisfactory

Pull on hand brake: **60 lb (27 kg)**

7. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	29th August 1969	
Type of sound level meter:	Brüel and Kjaer Type 2203	
Type of track:	Concrete	
Results of tests:	gear	8th
	travelling speed before acceleration	14·5 mile/h (23·3 km/h)
	sound level	88 dBA

8. NOISE MEASUREMENTS AT THE DRIVER'S EAR LEVEL

Date of tests:	29th August 1969
Type of sound level meter and octave filter:	Brüel and Kjaer Type 2203 with octave filter set Type 1612
Type of track:	Concrete

Results of Tests

Gear	Travelling speed, mile/h (km/h)	Loudness, sones
4	4·98 (8·01)	105

9. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 6th and 31st August 1969; N.I.A.E., Silsoe, Bedford, U.K.

Hydraulic fluid:

make and type:	Ford Specification ESEN-M2C86A
viscosity:	10·5 - 11·6 cS at 210°F (99°C)
viscosity index:	95

	Vertical movement, in (mm)	Maximum force exerted through full range, lb (kg)	Pressure, lb/in² (kg/cm²)	Linkage load at which unballasted front end of tractor lifts off the ground, lb (kg)
At lower hitch points (height above ground in down position $11\frac{3}{8}$ in (289 mm))	26 (660)	3500 (1588)	2550 (179)	- -
On the frame 24 in (610 mm) to rear of lower hitch points	30 (762)	3400 (1542)*	2550 (179)	2590 (1175)
On the frame 24 in (610 mm) to rear of lower hitch points	$34\frac{1}{2}$ (876)	2800 (1270)+	2550 (179)	2600 (1179)

*Results obtained with the top link attached to the top rocker position on the tractor

+Results obtained with the top link attached to the bottom rocker position on the tractor

Type of linkage lock for transport:	Hydraulic
Opening pressure of the cylinder over pressure relief valve (manufacturer's figures):	2750-2850 lb/in² (193-200 kg/cm²)

Pump characteristics

i)	Opening pressure of relief valve:	2270 lb/in²	(160 kg/cm²)
	Sustained pressure of the open relief valve:	2560 lb/in²	(180 kg/cm²)

Pump delivery at external tapping

ii)	at minimum pressure (rated engine speed):	5·0 gal/min	(22·7 l/min)
iii)	at maximum hydraulic power	5·1 gal/min	(23·2 l/min)
	delivery pressure:	2270 lb/in²	(160 kg/cm²)
	power:	8·10 hp	(8·2 metric hp)

15. REPAIRS AND ADJUSTMENTS DURING TESTS

A fuel injector was replaced during the drawbar tests to rectify a slight loss of power

REMARKS

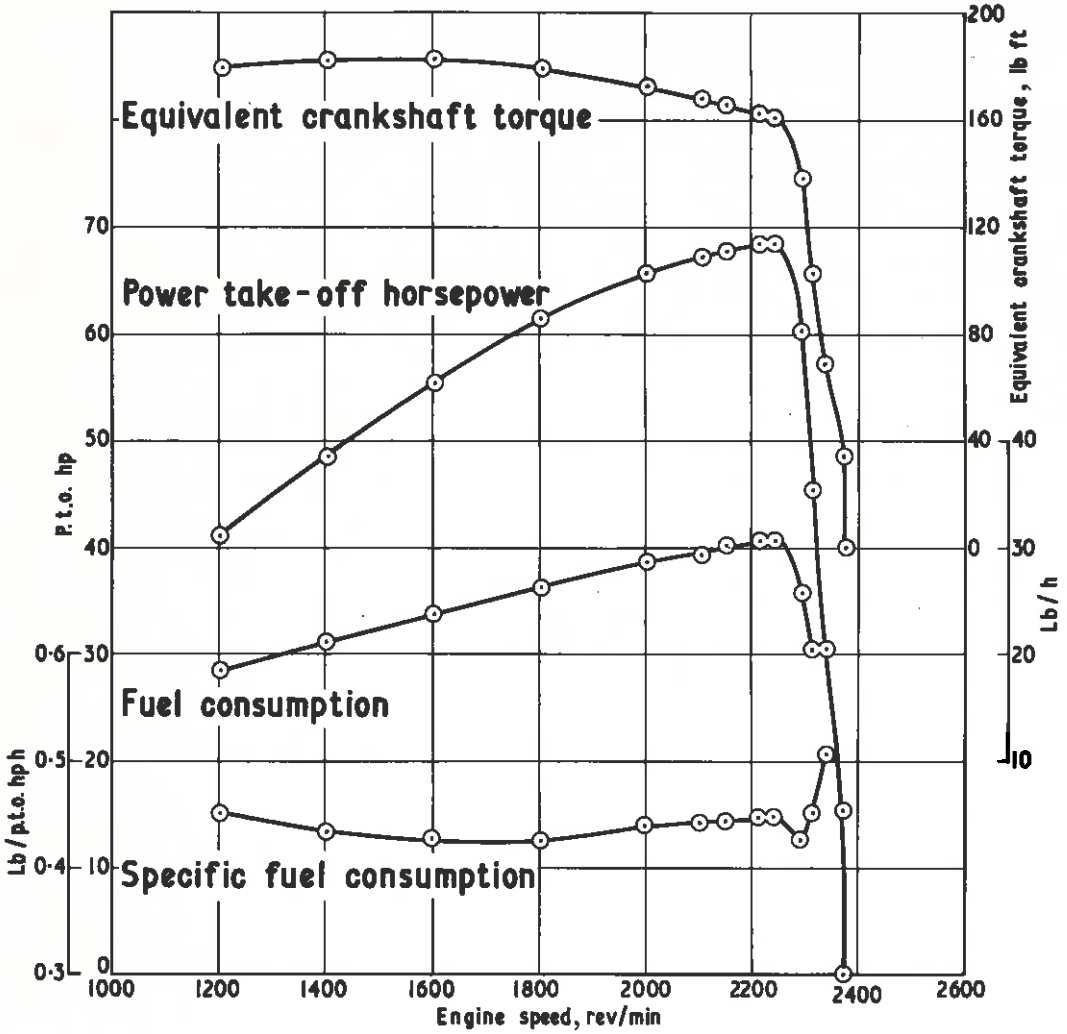
When the engine was running at maximum power the exhaust smoke density was rather high. Oil leaked from around the base of the high-low gear shift lever (Ref.1).

Officer in charge: D.W. SMITH

Head of Tractor and Ergonomics Department: J. MATTHEWS

Date: 5th December 1969

Ref.1. The manufacturer states that a modification in the form of a breather tube was introduced in production from 16th June 1969. The tractor on which the tests were carried out was manufactured prior to that date.



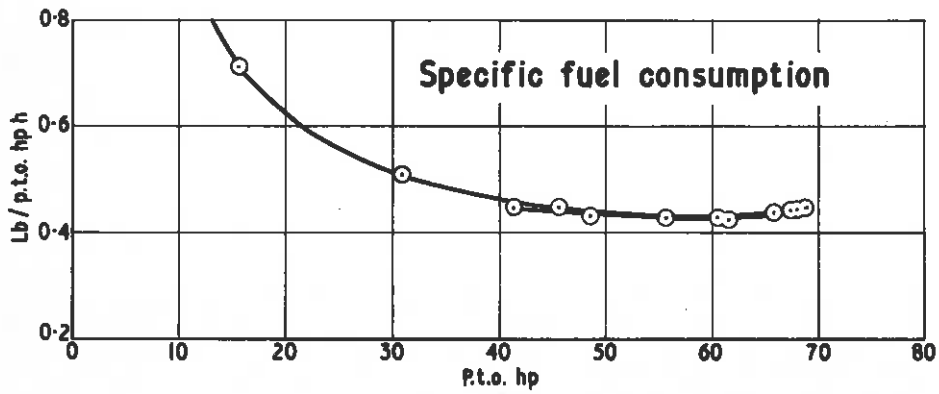


Fig. 1. Power take-off test

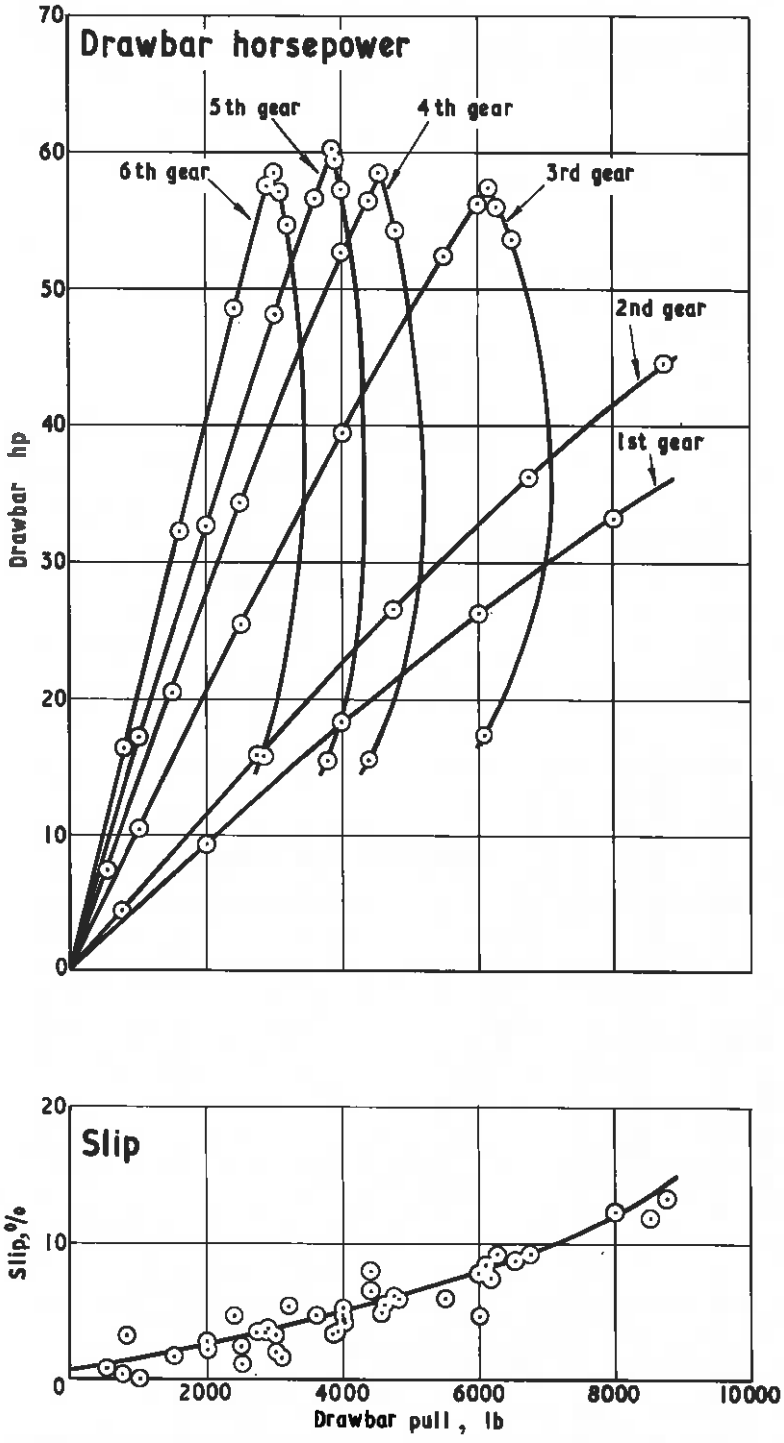


Fig.2. Drawbar test on concrete, with ballast

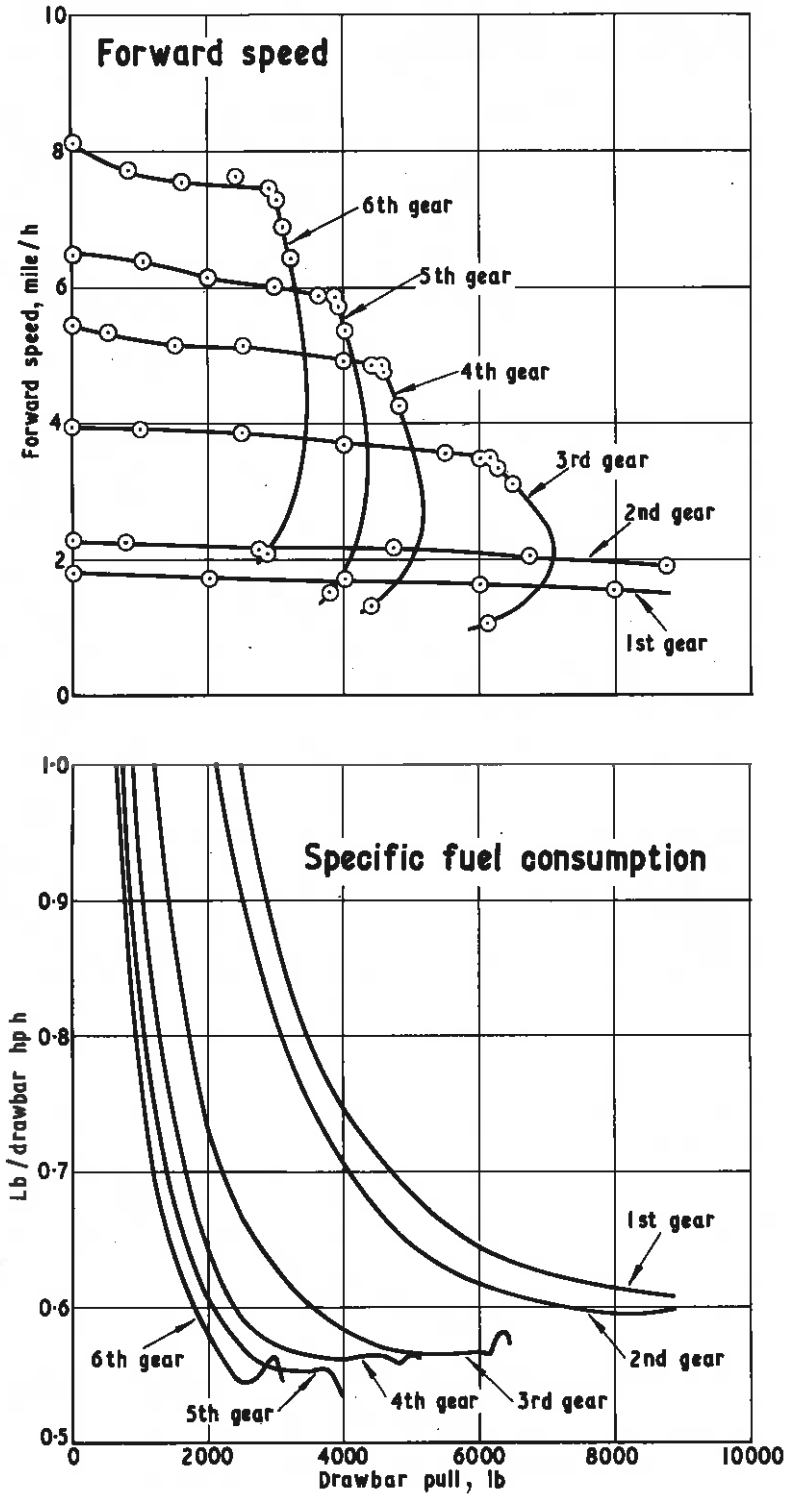


Fig. 3. Drawbar test on concrete, with ballast

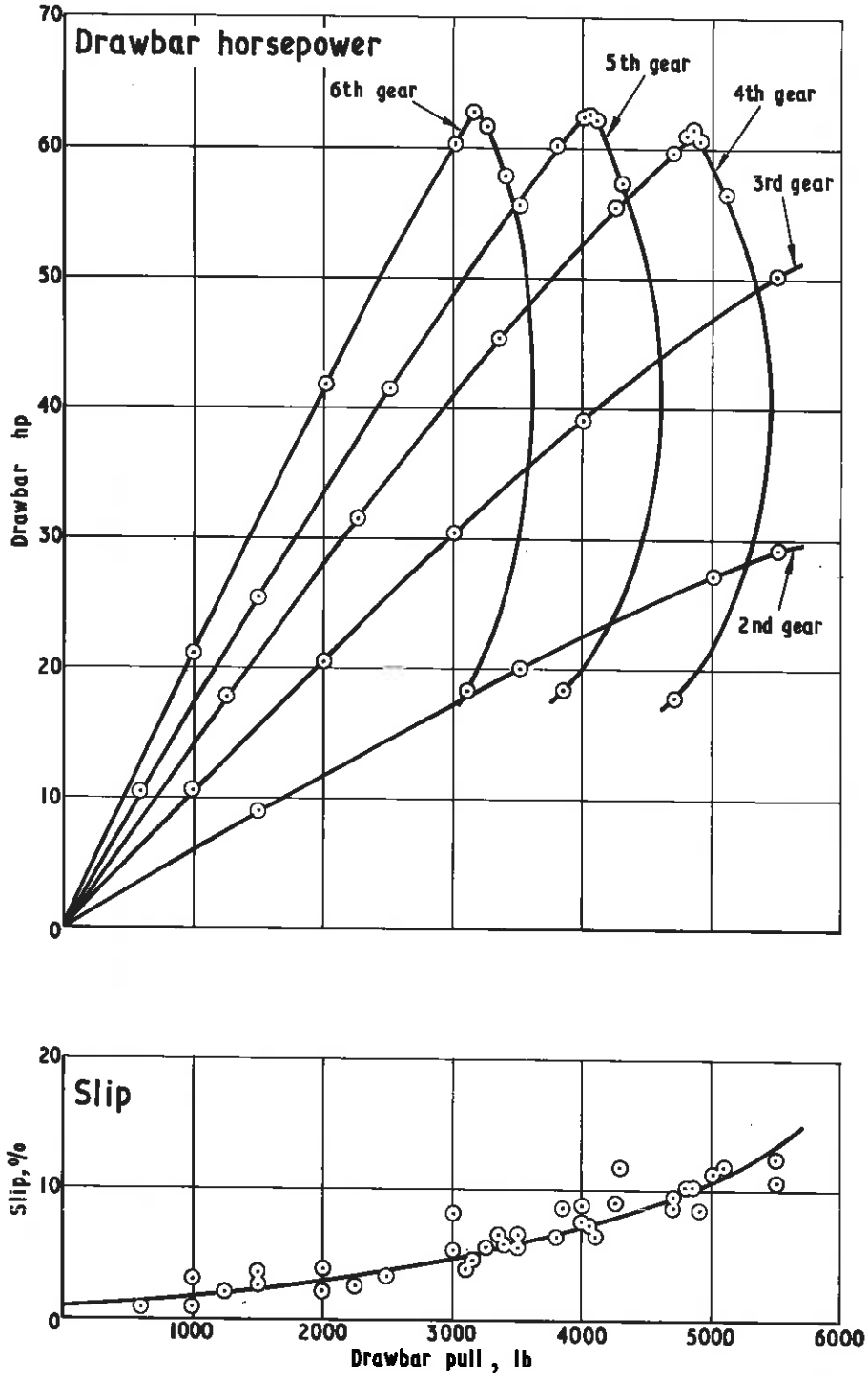


Fig. 4. Drawbar test on concrete, without ballast

Henry Burt & Son Ltd, College Street, Kempston, Bedford