



O.E.C.D. Approval 246b

Report 624

February 1972

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

MASSEY-FERGUSON MODEL 165 TRACTOR

(with oil-immersed, multi-disc brakes)



Test No.: R72/7631/O.E.C.D.

Manufacturer: Massey-Ferguson Manufacturing Ltd,
Banner Lane, Coventry

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 : Massey-Ferguson Manufacturing Ltd.,
Banner Lane,
Coventry

Submitted for test by : The manufacturer

Selected by : The manufacturer with the agreement
of the testing station

Tractor

Make : Massey-Ferguson

Model : M.F. 165

Type : Four wheel, rear wheel driven,
unit construction

Serial No. : 101432

Engine

Make : F. Perkins Ltd., Peterborough

Model : A4.212

Type : 4-stroke, direct injection diesel

Serial No. : 212 UA 108381

Cylinders : 4 cylinders, vertical, in-line,
3.875 in (98.4 mm) bore x 4.5 in
(114.3 mm) stroke, capacity 212.3 in³
(3.479 l), compression ratio 15.5:1,
overhead in-line valves, replaceable
cast-iron dry cylinder liners

Fuel system : AC model VP mechanical type fuel feed
pump with hand primer; two pressurized
CAV filters in series, with water
coalescent paper replaceable elements;
primary filter with transparent sediment
bowl and drain tap; gauze strainers in
fuel tank, lift pump and fuel injection
pump; capacity of fuel tank 15 UKgal
(68.2 l). CAV type DPA 324 1100Y
injection pump, Serial No. R 27387 NJ;
manufacturer's production setting :
21.9 lb/h (9.93 kg/h) to 23.0 lb/h
(10.43 kg/h) at 2000 rev/min rated engine
speed and 145°F (63°C) pump temperature,
using fuel of 0.837 specific gravity at
60°F (15.6°C). CAV type BDLL 150S 6507
injector nozzles, injector setting
170-175 atm (176-181 kg/cm²)

- Governor** : CAV mechanical, incorporated in fuel injection pump, governed range of engine speed 500 to 2200 rev/min, rated engine speed 2000 rev/min
- Air cleaner** : AC oil bath, under hood forward of radiator (centrifugal pre-cleaner available, not fitted), oil capacity $1\frac{1}{2}$ pt (0.85 l)
- Lubrication system** : Forced feed from eccentric rotor type pump with metal strainer in sump. AC full flow replaceable element filter, total oil capacity 16 pt (9.1 l), recommended oil change period 300 h
- Cooling system** : Water cooled, pressurized at 10 lb/in² (0.7 kg/cm²), impeller assisted with $16\frac{1}{4}$ in (413 mm) dia, belt driven 2 blade fan, 180°F (82°C) thermostat for temperature control, cooling water capacity 3 UKgal (13.6 l)
- Starting system** : Electrical, 12V Lucas type M 45 G solenoid engaged starter motor, operable only when high-low range gear selector lever is in neutral, CAV Mark IIIC inlet manifold flame type cold starting aid
- Electrical system**
- Voltage** : 12, negative earth
 - Generator** : Lucas type C 40 A
 - Battery** : Exide type 6TXAZ15L, lead acid, capacity 96 Ah at 10 hour rating
- Transmission**
- Clutch** : Auburn Laycock dual dry clutch, two plates, 9 in (229 mm) dia for p.t.o. shaft drive and 11 in (279 mm) dia for gearbox drive, pedal operated
- Gearbox** : Own make, sliding gear type, 6 forward speeds and 2 reverse, comprising constant mesh input gears, 3 forward and 1 reverse speed gearbox and dual range epicyclic reduction gear at output end
- Rear axle and final drive** : Own make, crown wheel and pinion with bevel gear type differential and epicyclic reduction gear final drives, pedal operated differential lock
- Oil capacities** : Transmission 48 pt (27.3 l), final drives 2 pt (1.1 l) each. Recommended oil change period 600 h

Gear	Number of engine revolutions for 1 revolution of driving wheel	Nominal travelling speed for 2000 rev/min rated speed of engine, mile/h (km/h)
Forward		
1	224.55	1.38 (2.22)
2	149.70	2.07 (3.33)
3	81.65	3.79 (6.10)
4	56.14	5.51 (8.85)
5	37.42	8.27 (13.31)
6	20.41	15.16 (24.39)
Reverse		
Low	164.88	1.88 (3.02)
High	41.22	7.51 (12.08)

Power take-off

Main

- : Manually engaged, proportional engine speed or proportional ground speed, 6-spline, 1 $\frac{1}{8}$ in (34.9 mm) dia, at rear of tractor in vertical centre plane, height above ground 22 $\frac{1}{2}$ in (572 mm)

Proportional engine speed

- : 641 rev/min at 2000 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1684 rev/min engine speed. Independent of main clutch, direction of rotation clockwise viewed from tractor rear

Proportional ground speed

- : 1 revolution of p.t.o. for approximately 20 in (508 mm) of travel, direction of rotation clockwise viewed from tractor rear in forward gear

Belt pulley

- : Attachable to rear of tractor in two alternative horizontal positions, main p.t.o. driven, manually engaged, 10 $\frac{1}{4}$ in (260 mm) dia x 6 $\frac{1}{2}$ in (165 mm) face width, 1191 rev/min giving 3197 ft/min (16.24 m/s) linear speed at 2000 rev/min rated engine speed. 1155 rev/min giving 3100 ft/min (15.75 m/s) linear speed at 1940 rev/min engine speed. Direction of rotation related to position of unit; clockwise with pulley on right side and anti-clockwise with pulley on left side, viewed from tractor right side

Power lift

- : Own make, live hydraulic, 4-cylinder piston type pump with Ferguson suction side control, oil from transmission supplied to single acting ram cylinder and 4 external tappings

Controls

- : Two way draught control with top link sensing, controls for position and selective response on drop. External oil supply operated by tractor hydraulic controls or external spool valves. Pressure control for selective weight transfer from semi-mounted implements by direct action from lower links (or through the pressure control coupler when fitted, in the case of towed implements and trailers) and control of pressure for external supply. Three point linkage, adjustable lift rods, lower links with interchangeable Category 1 and Category 2 hinged ends, vertical lift movement above ground : 7 in (178 mm) to $35\frac{1}{2}$ in (902 mm) or $19\frac{1}{2}$ in (495 mm) to $41\frac{1}{2}$ in (1048 mm) depending on lift rod position

Auxiliary hydraulics

- : Available (not fitted), own make, live, oil from transmission supplied to external spool valves

Drawbar

Linkage drawbar

- : Drawbar fixed on lower links, with central hole and 4 holes $2\frac{3}{8}$ in (54 mm) apart either side of centre line, vertical adjustment from $9\frac{3}{4}$ in (248 mm) to $21\frac{5}{8}$ in (549 mm) changed by adjustable stay links, drawbar holes to take $\frac{3}{4}$ in (19 mm) dia pin, distance from rear axle $36\frac{1}{2}$ in (927 mm) as tested

Swinging drawbar

- : Radius of swing $24\frac{7}{8}$ in (632 mm) and $29\frac{1}{2}$ in (749 mm), lateral adjustment $17\frac{3}{4}$ in (451 mm) and $21\frac{1}{4}$ in (540 mm), vertical heights to centre of clevis, 6 positions from $14\frac{1}{2}$ in (362 mm) to $15\frac{3}{4}$ in (400 mm), drawbar hole to take 1 in (25 mm) dia pin, distance behind rear axle $17\frac{3}{8}$ in (441 mm), $19\frac{7}{8}$ in (505 mm) and $24\frac{1}{2}$ in (622 mm), position relative to p.t.o. $7\frac{3}{8}$ in (181 mm), 9 in (244 mm) and $14\frac{1}{4}$ in (362 mm) to rear

Hitch

Rear

- : Automatic hitch (optional, not fitted), hook type, height above ground $16\frac{3}{8}$ in (416 mm), distance from rear axle $7\frac{7}{8}$ in (200 mm) to rear

Front

- : Towing hitch combined with front weight carrier, height above ground to centre of clevis $26\frac{3}{4}$ in (679 mm)

Brakes

- : Girling, multi plate disc type, oil immersed, on rear axle high speed shafts; independent or combined pedal operated, hand lever with ratchet operating both brakes for parking

Steering

- : Worm and peg type with single drag link (power assistance optional, not fitted)

Wheels

Steering wheels	:	Two at front, tyres Goodyear Super Rib, 6.00 - 19, 6 ply rating, maximum permissible weight on each tyre, 1500 lb (680 kg) at 48 lb/in ² (3.4 kg/cm ²), track width 48 in (1219 mm) by 4 in (102 mm) steps to 72 in (1829 mm) changed by extending front axle
Driving wheels	:	Two at rear, tyres Goodyear Traction Sure Grip, 14 - 30, 6 ply rating on D7 14 rims, maximum permissible weight on each tyre 3920 lb (1778 kg) at 16 lb/in ² (1.1 kg/cm ²), track width 56 in (1422 mm) by 4 in (102 mm) steps to 88 in (2235 mm), changed by reversing inner and outer wheel centres and offset lug type rims
Wheelbase	:	6 ft 10 in (2083 mm)

Tractor weights

(Without driver but with tanks full)

Weight without ballast	:	Front	1873 lb (850 kg)
	:	Rear	2956 lb (1341 kg)
	:	Total	4829 lb (2191 kg)
Weight with full ballast	:	Front	2963 lb (1344 kg)
	:	Rear	7712 lb (3498 kg)
	:	Total	10 675 lb (4842 kg)

Seat

: Kneodler type made by Sankey of Wellington upholstered cushion and back rest, parallelogram linkage with spring and hydraulic damper adjustable for driver's weight. Range of adjustment 2½ in (63.5 mm) fore and aft in median plane of tractor

Number of grease points

: Whole tractor 13

Overall dimensions

Overall length

- without front weights : 11 ft 3½ in (3.44 m)
- with front weights : 12 ft 1½ in (3.69 m)

Overall width

- without ballast weights : 6 ft 2 in (1.88 m)
at 56 in (1422 mm) track
- with ballast weights : 9 ft 2 in (2.79 m)
at 56 in (1422 mm) track

Overall height to top of

steering wheel : 65½ in (1664 mm)

Overall height to top of

exhaust pipe : 84 in (2134 mm)

Minimum ground clearance - to

underside of gearbox casing : 17¾ in (451 mm)

- to

underside of swinging drawbar : 10¾ in (273 mm)

Lighting

	Height above ground of centre, in (cm)	Size, in (cm)	Distance from outside edge of tractor, at 56 in (1422 mm) wheel track, to centre, in (cm)
Headlights	41 (104)	4 (10.2) dia	27 $\frac{3}{4}$ (70.5)
Side lights	59 (150)	2 (5.1) dia	6 $\frac{3}{4}$ (16.8)
Rear lights	57 $\frac{3}{4}$ (147)	4 $\frac{1}{2}$ (11.4) x	8 $\frac{3}{8}$ (21.9)
Reflectors	55 (140)	2 (5.1) 2 $\frac{3}{4}$ (7.0) x 1 $\frac{1}{2}$ (3.8)	8 $\frac{5}{8}$ (21.9)
Unrestricted beam angle of headlight in plan view 100°			

LUBRICANTS USED IN TESTS

Engine	: Esso Tractorlube Universal
Transmission	: Esso IL 1941
Final drives	: Esso Tractorlube Gear Oil GP 90/140

COMPULSORY TESTS

6. BRAKING

Date of tests	: 8th December 1971 - 19th January 1972
Type of track	: Concrete roadway
Type of decelerometer	: Moto Meter, Recording Type

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/s ² (m/s ²)	14.5 (4.4)	16.0 (4.9)
Stopping distance, ft (m)	18.3 (5.6)	19.0 (5.8)
Force on brake pedal, lb (kg)	76 (34)	116 (53)
Force exerted on the brake pedal to achieve a deceleration of 8.2 ft/s ² (2.5 m/s ²), lb (kg)	29 (13)	60 (27)

Brake fade characteristics (hot tests)

Maximum deceleration hot/maximum deceleration cold x 100	: 100%
Stopping distance cold/stopping distance hot x 100	: 97%
Force on pedal cold/force on pedal hot x 100	: 102%
Efficiency of handbrake	: Satisfactory facing up and down slope
Pull on handbrake	: 80 lb (36 kg)

The Model 165 tractor tested is generally similar to that specified in O.E.C.D. Test Serial No. 246 (N.I.A.E. Report No. 593/OECD). The differences are concerned only with the type of brakes and modifications to the rear axles to house them. The unballasted tractor weight is within 5% of the weight of the tractor reported in O.E.C.D. Test 246. The other performance results from Test 246, given in the Appendix, may therefore be taken as applying to this tractor.

REPAIRS AND ADJUSTMENTS : None

REMARKS : None

Officer in charge : D.W. SMITH

Head of Tractor and
Ergonomics Department : J. MATTHEWS

Date : 22nd February 1972

Appendix

Tractor and ballast weights

(Without driver but with tanks full)

Weight without ballast

Front	:	1770 lb (803 kg)
Rear	:	2861 lb (1298 kg)
Total	:	4631 lb (2101 kg)

Ballast Front	:	weights - 2 per wheel, total 538 lb (244 kg) liquid - nil
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Rear	:	weights - 15 per wheel, total 3492 lb (1584 kg) liquid - 1459 lb (662 kg)
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Additional	:	8 front frame weights and frame, total 549 lb (249 kg)
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Weight with full ballast

Front	:	2982 lb (1353 kg)
Rear	:	7687 lb (3487 kg)
Total	:	10 669 lb (4839 kg)

FUELS AND LUBRICANTS USED IN TESTS

Fuel	:	Diesel oil, density 0.845 at 60°F (15.6°C), Cetane No. 53 to Class A B.S.2869:1957
Engine oil	:	Shell Multi-Purpose, 20W/30
Transmission oil	:	Shell Multi-Purpose, 20W/30
Final drives	:	Shell Spirax 90 EP

COMPULSORY TESTS

1. MAIN POWER - TAKE-OFF PERFORMANCE

Date and location of tests: 29th January 1968; 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					
61.8 (62.7)	2098	673	2.87 (13.05)	0.393 (176)	21.5 (4.80)
Standard p.t.o. speed (540 rev/min)					
53.0 (53.7)	1684	540	2.39 (10.86)	0.380 (170)	22.2 (4.95)
Standard belt speed of 3100 ft/min (945 m/min)					
58.2 (59.0)	1940	622	2.66 (12.09)	0.387 (173)	21.9 (4.89)
*The speed recommended by the manufacturer for drawbar work					
59.6 (60.4)	2000	641	2.74 (12.46)	0.389 (174)	21.7 (4.84)
Fuel consumption at part loads					
53.8 (54.6)	2147	689	2.55 (11.59)	0.400 (179)	21.1 (4.71)
0	2198	705	0.75 (3.41)	-	-
27.2 (27.6)	2176	698	1.54 (7.00)	0.479 (214)	17.7 (3.95)
61.8 (62.7)	2098	673	2.87 (13.05)	0.393 (176)	21.5 (4.80)
13.7 (13.9)	2184	700	1.12 (5.09)	0.691 (309)	12.2 (2.72)
40.7 (41.3)	2165	694	2.04 (9.27)	0.424 (190)	20.0 (4.46)

No load, maximum engine speed 2198 rev/min

Equivalent crankshaft torque at maximum power 154.7 lb ft (21.4 kg m)

Maximum equivalent crankshaft torque 169.0 lb ft (23.4 kg m) at 1420 rev/min
engine speed

Mean atmospheric conditions	temperature	67°F (19°C)
	pressure	30.10 in Hg (765 mm Hg)
	relative humidity	33%
Maximum temperature	coolant	188°F (87°C)
	engine oil	232°F (111°C)
	fuel	70°F (21°C)

*The manufacturer made no specific recommendation for speed for drawbar work and the results given are at the rated engine speed.

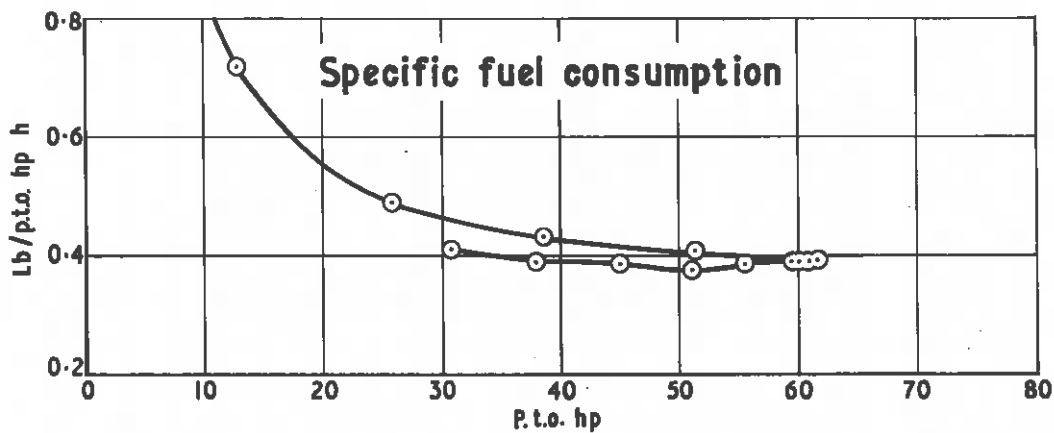
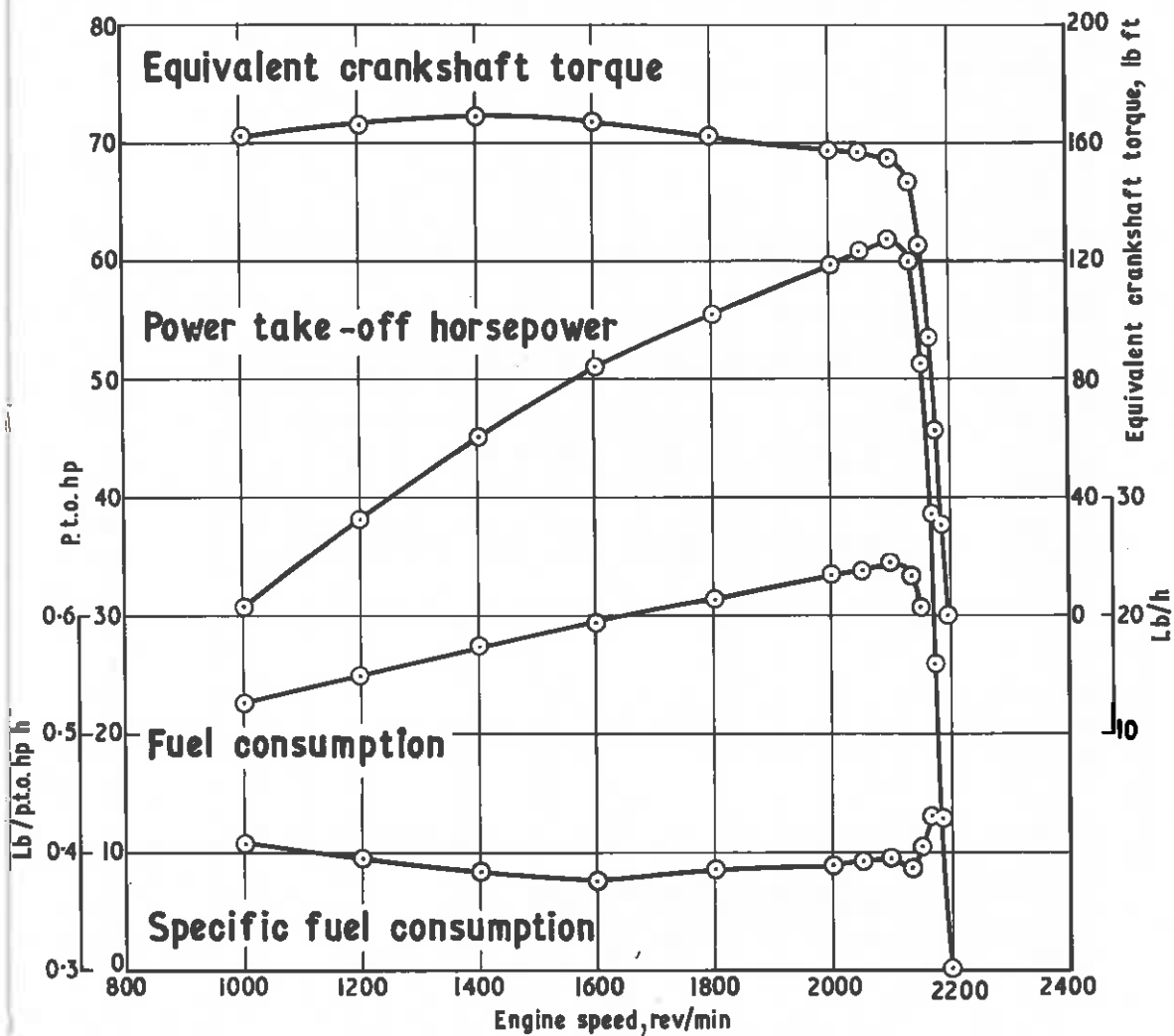


Fig.1. Power take-off test

2. DRAWBAR PERFORMANCE

Date of tests: March 1968.

Type of track: Tarmacadam

Height of drawbar above ground: 20 in (508 mm)

Gear	Horse- power (Metric hp)	Drawbar pull, lb (kg)	Speed, mile/h (km/h)	Engine speed, rev/min	Wheel- slip, %	Specific fuel consumption,		Coolant Fuel Engine oil	Atmospheric conditions		
						lb/drawbar hp h (g/metric drawbar hp h)	drawbar hp h/ UKgal (metric drawbar hp h/l)		Temperature, °F (°C)	Temperature, Relative °F (°C) humidity, % Pressure, in Hg (mm Hg)	
(i) Maximum power (ballasted)											
1	+30.0 (30.4)	9000 (4082)	1.25 (2.01)	2112	15.0	0.541 (242)	15.6 (3.48)	125 (52)	155 (68)	59 (15)	29.35 (745)
2	+44.7 (45.3)	9000 (4082)	1.86 (2.99)	2084	15.0	0.507 (227)	16.7 (3.73)	124 (51)	155 (68)	59 (15)	29.35 (745)
3	54.5 (55.3)	5400 (2449)	3.78 (6.08)	2106	7.3	0.459 (205)	18.4 (4.11)	130 (54)	160 (71)	53 (12)	29.47 (749)
4	55.1 (55.9)	3650 (1656)	5.66 (9.11)	2105	4.2	0.450 (201)	18.8 (4.19)	136 (58)	150 (66)	50 (10)	29.22 (742)
5	54.3 (55.1)	2350 (1066)	8.66 (13.93)	2111	2.6	0.458 (205)	18.5 (4.13)	130 (54)	138 (59)	54 (12)	29.22 (742)
(ii) Five hour test at 75% of pull at maximum power											
4	42.4 (43.0)	2740 (1243)	5.80 (9.33)	2133	3.3	0.461 (206)	18.3 (4.08)	150 (66)	190 (88)	66 (19)	29.33 (745)
(iii) *Five hour test at pull corresponding to 15% wheelslip in Test (i)											
2	-	9000 (4082)	1.92 (3.09)	-	-	-	-	178 (81)	219 (104)	71 (22)	29.31 (744)
(iv) Maximum power (unballasted)											
2	24.5 (24.8)	4800 (2177)	1.92 (3.09)	2118	14.2	-	-	114 (46)	167 (75)	47 (8)	30.40 (772)
3	45.6 (46.2)	4800 (2177)	3.56 (5.73)	2115	14.2	-	-	130 (54)	180 (82)	50 (10)	30.40 (772)
4	56.3 (57.1)	3850 (1746)	5.48 (8.82)	2114	8.6	-	-	147 (64)	173 (78)	47 (8)	30.40 (772)
5	57.1 (57.9)	2500 (1134)	8.56 (13.77)	2091	4.7	-	-	130 (54)	171 (77)	47 (8)	30.40 (772)

Total oil consumption during ten hours duration of tests (ii) and (iii) 0.006 lb/h (2.8 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.

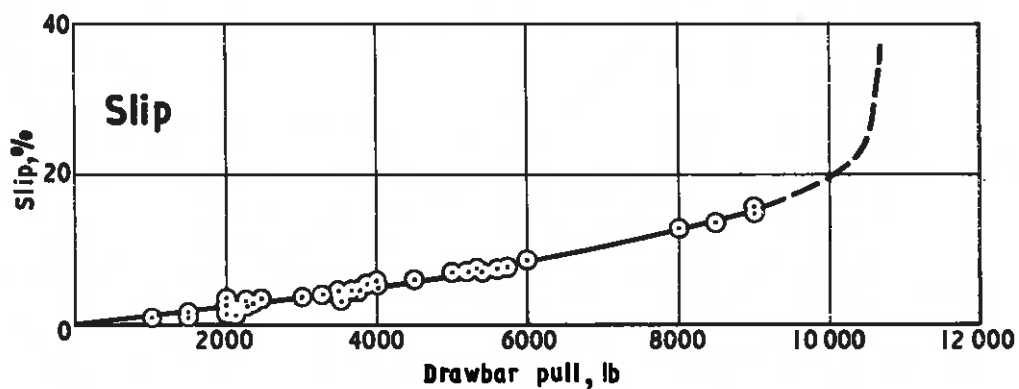
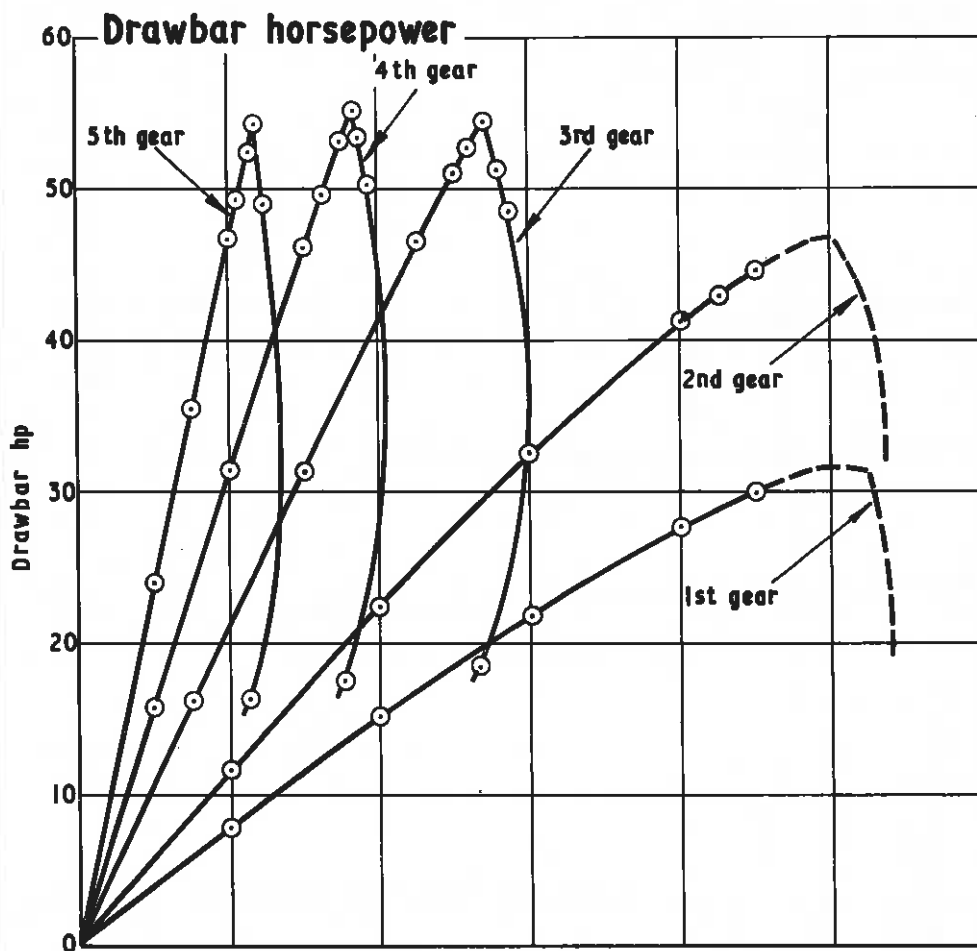


Fig.2. Drawbar test on tarmacadam, with ballast

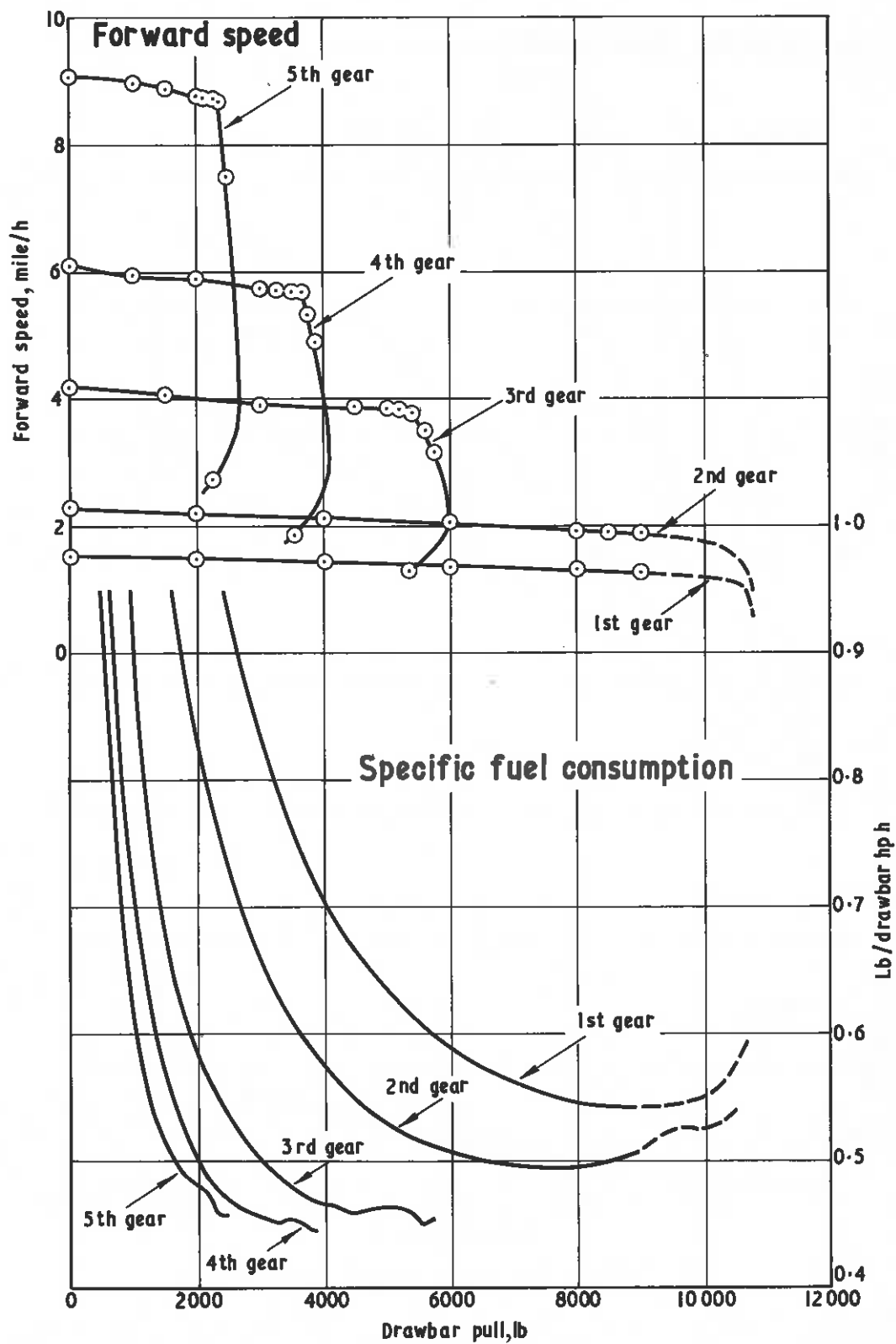


Fig.3. Drawbar test on tarmacadam, with ballast

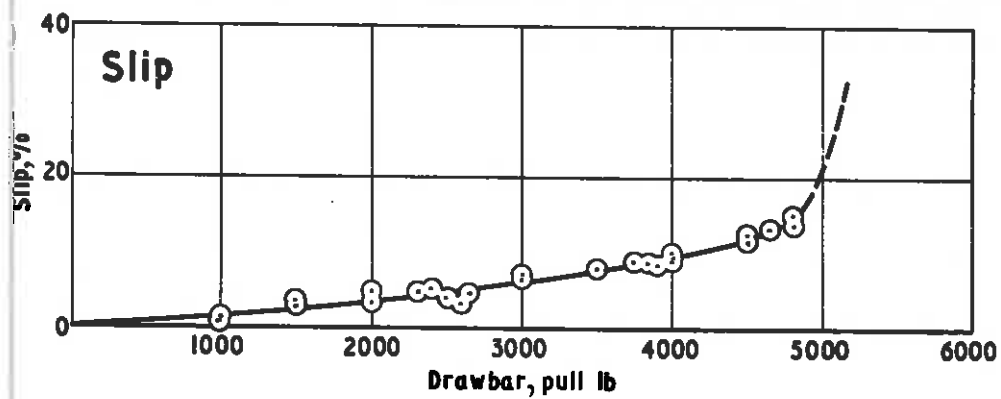
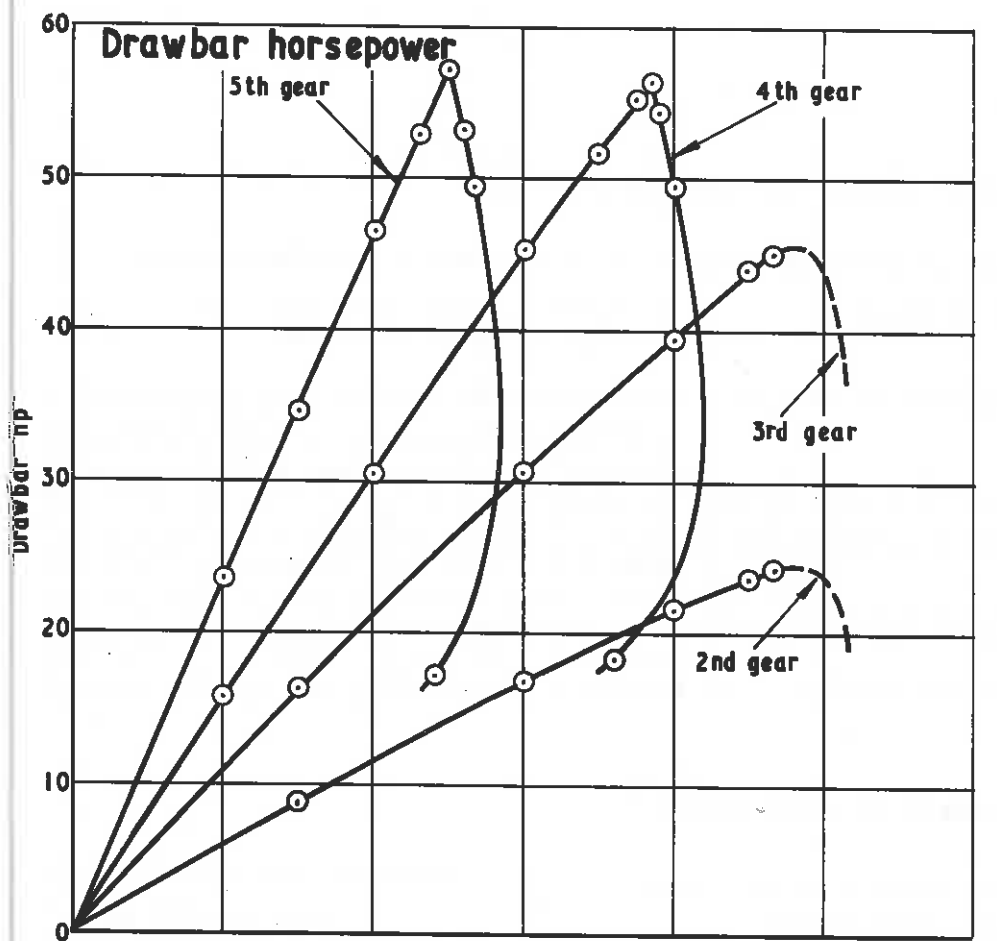


Fig.4. Drawbar test on tarmacadam, without ballast

3. and 4. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment : As in specification, without ballast

Track of wheels : front - 48 in (1219 mm)
rear - 56 in (1422 mm)

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space	10 ft 8 in (3.25 m)	10 ft 7 in (3.22 m)	11 ft 4 in (3.45 m)	11 ft 4 in (3.45 m)
Radius of turning circle	10 ft 3 in (3.12 m)	10 ft 2 in (3.10 m)	10 ft 11 in (3.33 m)	10 ft 11 in (3.33 m)

5. LOCATION OF CENTRE OF GRAVITY

Height above ground	30.8 in (782 mm)
Distance forward from the vertical plane containing the axis of the rear wheels	30.6 in (777 mm)
Distance from the median plane of the tractor	0

7. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests: 3rd April 1968
 Type of sound level meter: Brüel and Kjoer Type 2203
 Type of track: Tarmacadam
 Results of tests: gear 6th
 travelling speed
 before acceleration 12.5 mile/h (20.1 km/h)
 sound level 87 dBA

8. NOISE MEASUREMENTS AT THE DRIVER'S EAR LEVEL

Date of tests: 3rd April 1968
 Type of sound level meter and octave filter: Brüel and Kjoer Type 2203 with octave filter set Type 1612
 Type of track: Tarmacadam

Results of Tests

Gear	Travelling speed, mile/h (km/h)	Loudness, sones
3	3.9 (6.28)	137
6	16.7 (26.87)	117

9. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 23rd and 27th February 1968, N.I.A.E.
 Silsoe, Bedford

Hydraulic fluid:

make and type: Shell Tractor Oil Universaal
 viscosity: 20W/30
 viscosity index: 105

	Vertical movement, in (mm)	Maximum force exerted through full range, lb (kg)	Pressure, lb/in ² (kg/cm ²)	Linkage load at which unballasted front end of tractor lifts off the ground, lb (kg)
<u>Linkage giving maximum mechanical advantage</u> At lower hitch points (height above ground in down position 19 $\frac{3}{8}$ in (498 mm)) On the frame 24 in (610 mm) to rear of lower hitch points	21 $\frac{3}{4}$ (552)	5100 (2313)	3100 (218)	4800 (2177)
<u>Linkage giving minimum mechanical advantage</u> At lower hitch points (height above ground in down position 9 $\frac{3}{4}$ in (248 mm)) On the frame 24 in (610 mm) to rear of lower hitch points	26 (660)	3600 (1633)	3100 (218)	2750 (1247)
	28 $\frac{1}{2}$ (724)	3150 (1429)	3100 (218)	-
	32 $\frac{3}{4}$ (832)	3000 (1361)	3100 (218)	2500 (1134)

Type of linkage lock for transport

Hydraulic

Opening pressure of the cylinder over pressure relief valve (manufacturer's figures)

Not applicable

Pump characteristics

- i) Opening pressure of relief valve: 2700 lb/in² (190 kg/cm²)
Sustained pressure of the open relief valve: 3060 lb/in² (215 kg/cm²)
Pump delivery rate at external tapping
- ii) at minimum pressure (rated engine speed) 3.28 gal/min (14.9 l/min)
- iii) at maximum hydraulic power: 3.16 gal/min (14.4 l/min)
delivery pressure: 2700 lb/in² (190 kg/cm²)
power: 5.97 hp (6.05 metric hp)

OPTIONAL TESTS

10. PERFORMANCE AT THE ENGINE CRANKSHAFT

Date and location of tests 24th January 1968, N.I.A.E., Silsoe, Bedford,
U.K.

Type of dynamometer

Water brake, Heenan and Froude

Horsepower (Metric hp)	Engine speed, rev/min	UKgal/h (l/h)	Fuel consumption, lb/hp h (g/metric hp h)	hp h/UKgal (metric hp h/l)
Maximum power - 2 hour test				
63.6 (64.5)	2100	2.88 (13.09)	0.382 (171)	22.1 (4.93)
Standard p.t.o. speed (540 rev/min)				
54.4 (55.2)	1684	2.38 (10.82)	0.370 (166)	22.9 (5.11)
Standard belt speed of 3100 ft/min (945 m/min)				
60.0 (60.8)	1940	2.68 (12.18)	0.377 (169)	22.4 (5.00)
*The speed recommended by the manufacturer for drawbar work				
61.3 (62.2)	2000	2.74 (12.46)	0.378 (169)	22.3 (4.98)
Fuel consumption at part loads				
55.1 (55.9)	2139	2.51 (11.41)	0.385 (172)	22.0 (4.91)
1.7 (1.7)	2195	0.81 (3.68)	-	-
27.8 (28.2)	2158	1.52 (6.91)	0.463 (207)	18.3 (4.08)
63.6 (64.5)	2100	2.88 (13.09)	0.382 (171)	22.1 (4.93)
14.0 (14.2)	2170	1.07 (4.86)	0.644 (288)	13.1 (2.92)
41.5 (42.1)	2150	1.97 (8.96)	0.400 (179)	21.1 (4.71)

No load, maximum engine speed 2195 rev/min

Crankshaft torque at maximum power 159.1 lb ft (22.0 kg m)

Maximum crankshaft torque 173.3 lb ft (24.0 kg m) at 1420 rev/min
engine speed

Mean atmospheric conditions temperature 64°F (18°C)
pressure 30.15 in Hg (766 mm Hg)
relative humidity 34%

Maximum temperature coolant 189°F (87°C)
engine oil 229°F (109°C)
fuel 82°F (28°C)

Optimum fuel consumption recorded 0.362 lb/hp h (162 g/metric hp h) at
38.2 hp and 1390 rev/min

*The manufacturer made no specific recommendation for speed for drawbar work
and the results given are at the rated engine speed.

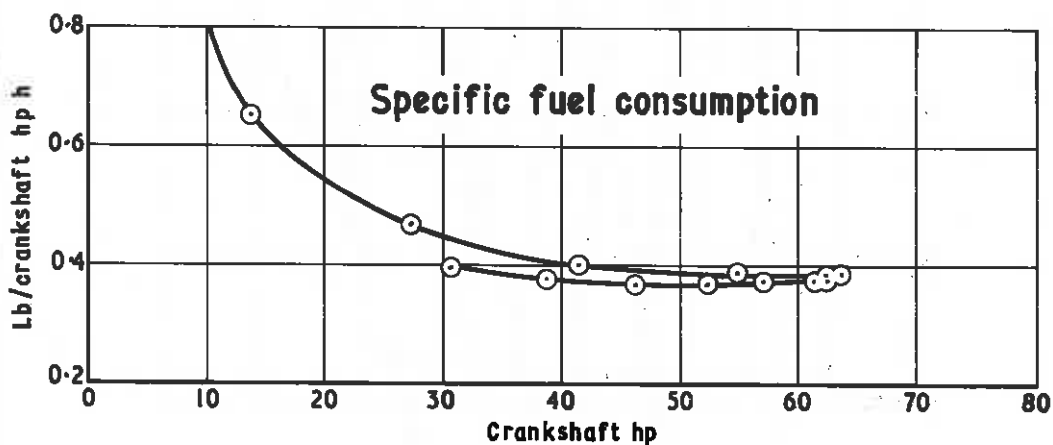
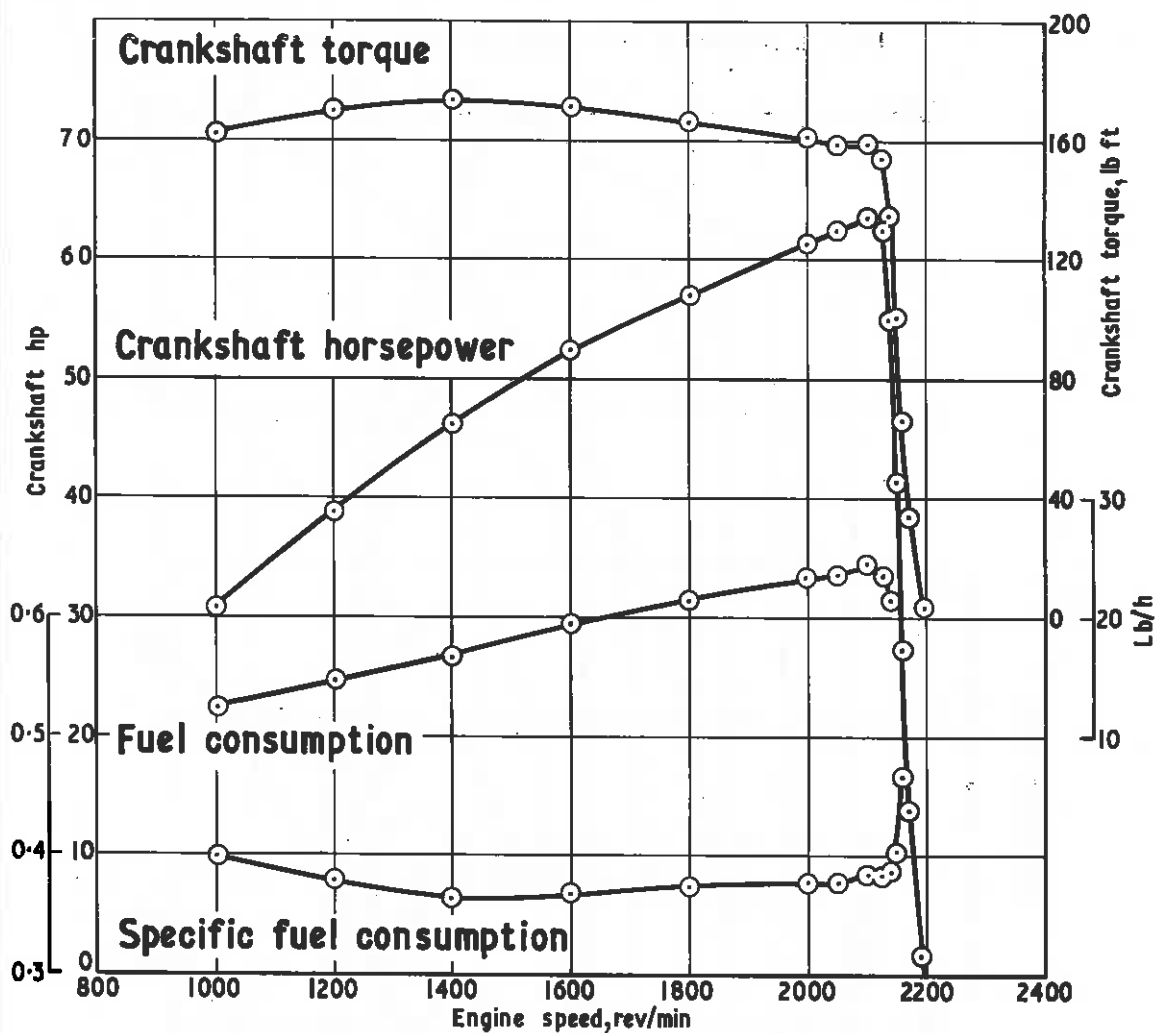


Fig.5. Engine test

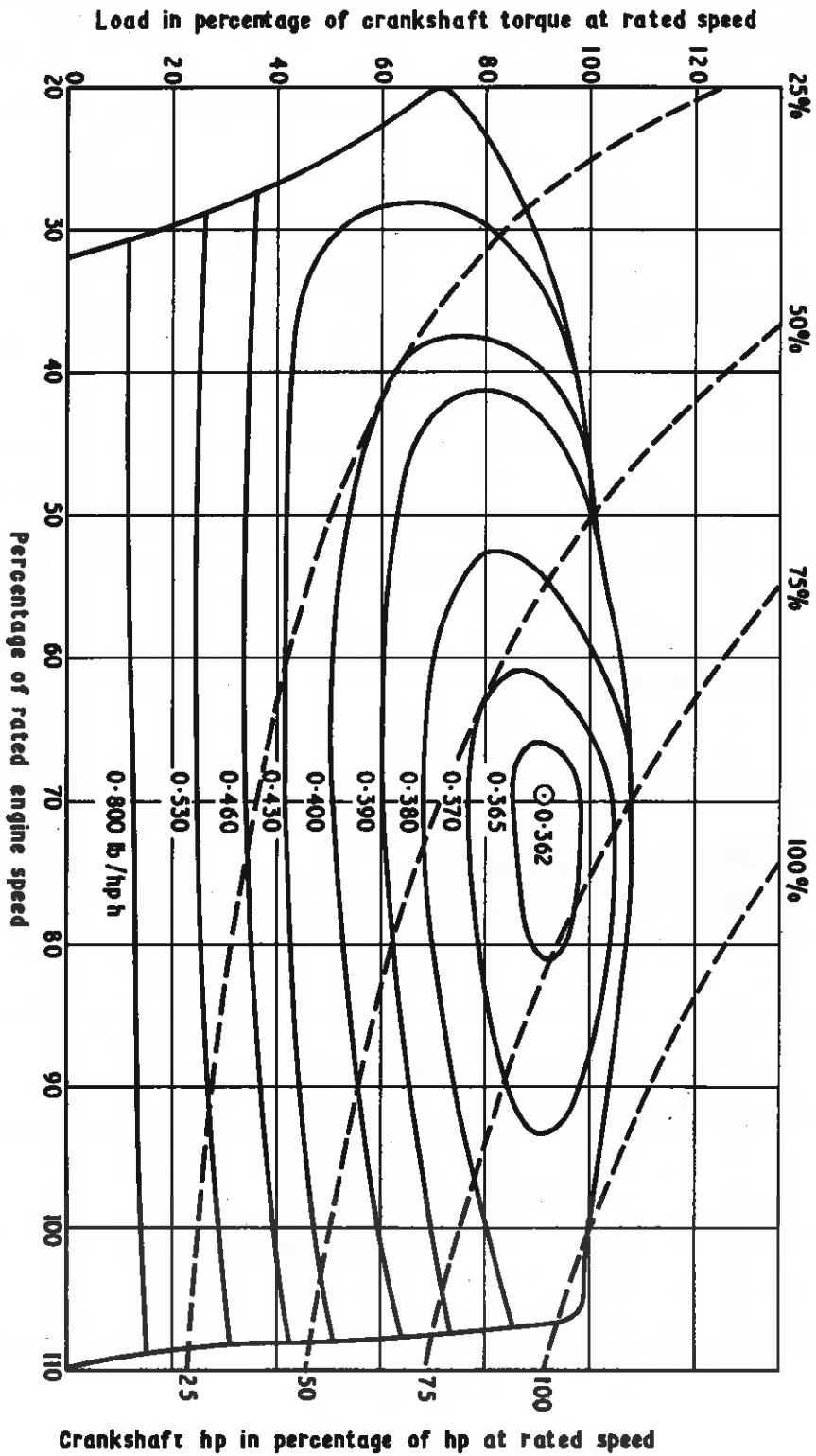


Fig. 6. Engine test

11. PERFORMANCE AT THE BELT PULLEY

Date and location of tests 1st February 1968, N.I.A.E., Silsoe,
Bedford, U.K.

Type of dynamometer Electrical swinging frame

Horsepower (Metric hp)	Speeds, rev/min		Fuel consumption,		
	Engine	Belt Pulley	UKgal/h (l/h)	lb/hp h (g/metric hp h)	hp h/UKgal (metric hp h/l)
Maximum power - 2 hour test					
58.9 (59.7)	2099	1250	2.86 (13.00)	0.411 (184)	20.6 (4.60)
Standard belt speed of 3100 ft/min (945 m/min)					
56.1 (56.9)	1940	1155	2.66 (12.09)	0.401 (179)	21.1 (4.71)
*The speed recommended by the manufacturer for drawbar work					
57.2 (58.0)	2000	1191	2.73 (12.41)	0.404 (181)	20.9 (4.66)
Fuel consumption at part loads					
51.2 (51.9)	2148	1279	2.56 (11.64)	0.422 (189)	20.0 (4.46)
0	2199	1310	0.76 (3.45)	-	-
25.8 (26.2)	2166	1290	1.54 (7.00)	0.506 (226)	16.7 (3.73)
58.9 (59.7)	2099	1250	2.86 (13.00)	0.411 (184)	20.6 (4.60)
13.0 (13.2)	2174	1295	1.12 (5.09)	0.728 (326)	11.6 (2.59)
38.6 (39.1)	2158	1285	2.01 (9.14)	0.439 (196)	19.2 (4.28)

No load, maximum engine speed 2199 rev/min

Equivalent crankshaft torque at maximum power 147.3 lb ft (20.4 kg m)

Maximum equivalent crankshaft torque 162.4 lb ft (22.5 kg m) at 1420 rev/min
engine speed

Mean atmospheric conditions	temperature	63°F (17°C)
	pressure	29.89 in Hg (759 mm Hg)
Maximum temperature	relative humidity	37%
	coolant	194°F (90°C)
	engine oil	232°F (111°C)
	fuel	78°F (26°C)

*The manufacturer made no specific recommendation for speed for drawbar work and the results given are at the rated engine speed.

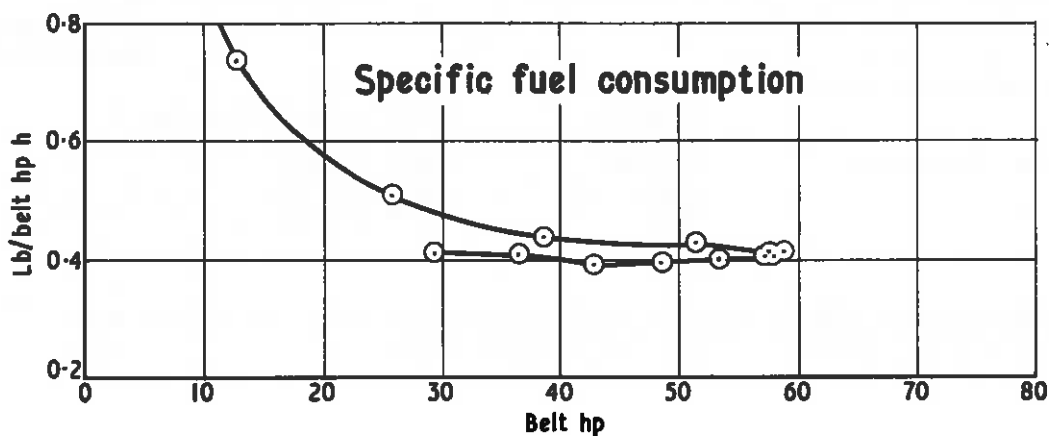
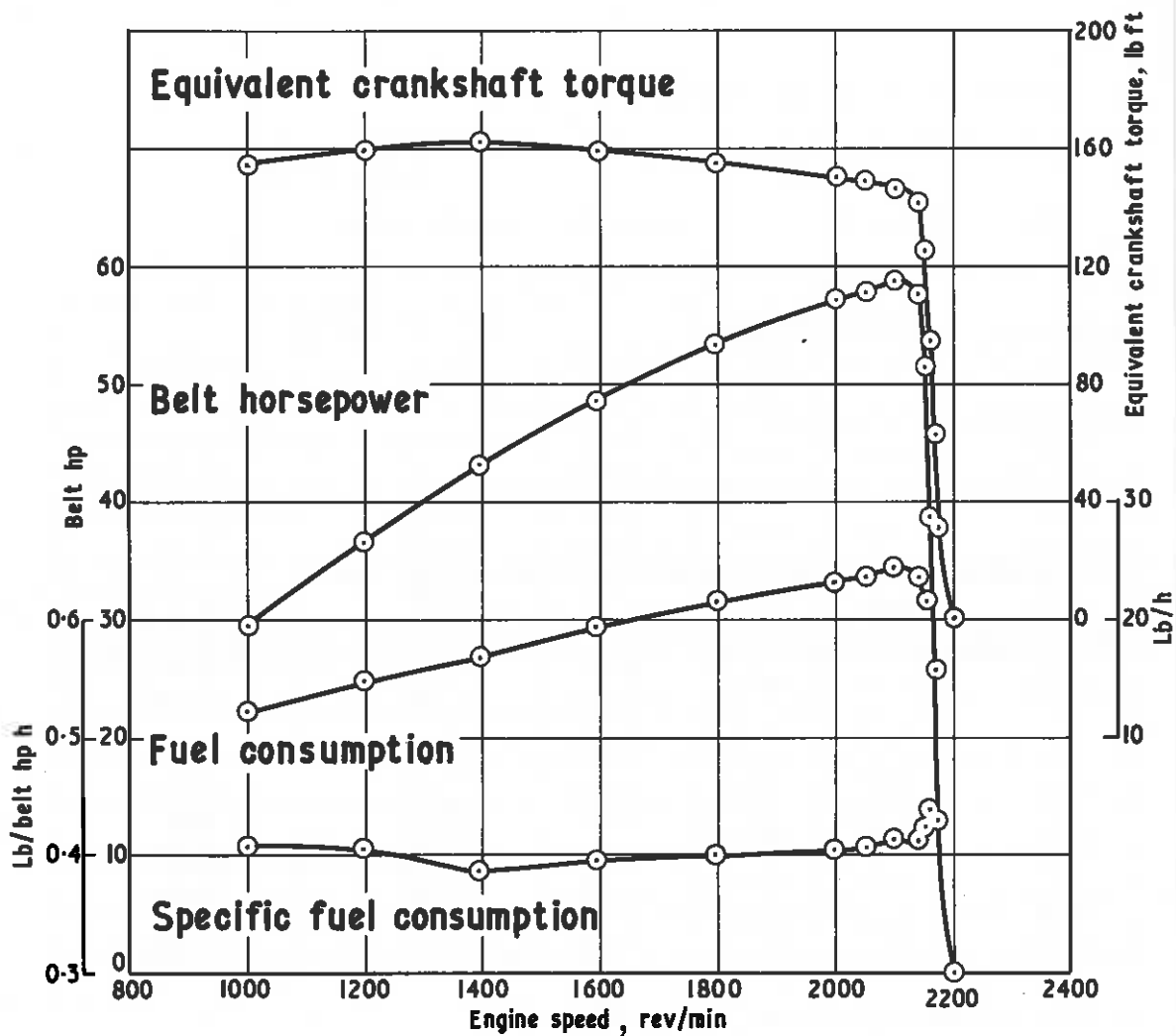


Fig.7. Belt test

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the 1990s, the number of people with a mental health problem has increased by 50% (Mental Health Foundation 2000).

There is a growing awareness of the need to address the needs of people with mental health problems, and the importance of providing them with appropriate services. However, there is a significant gap between the current state of affairs and the needs of the population. This gap is due to a number of factors, including a lack of resources, a lack of training, and a lack of awareness of the needs of the population. The purpose of this paper is to explore the current state of affairs and to identify the factors that contribute to the gap between the current state of affairs and the needs of the population.

The paper is organized as follows. First, we will discuss the current state of affairs in the UK. We will then discuss the factors that contribute to the gap between the current state of affairs and the needs of the population. Finally, we will discuss some of the ways in which the gap can be closed.

The current state of affairs in the UK is characterized by a significant gap between the current state of affairs and the needs of the population. This gap is due to a number of factors, including a lack of resources, a lack of training, and a lack of awareness of the needs of the population. The purpose of this paper is to explore the current state of affairs and to identify the factors that contribute to the gap between the current state of affairs and the needs of the population.

The factors that contribute to the gap between the current state of affairs and the needs of the population are a lack of resources, a lack of training, and a lack of awareness of the needs of the population. The lack of resources is due to a number of factors, including a lack of funding, a lack of staff, and a lack of facilities. The lack of training is due to a number of factors, including a lack of training opportunities, a lack of training materials, and a lack of training time. The lack of awareness of the needs of the population is due to a number of factors, including a lack of information, a lack of understanding, and a lack of empathy.

The gap between the current state of affairs and the needs of the population can be closed by addressing the factors that contribute to the gap. This can be done by increasing the resources available, by providing training opportunities, and by increasing awareness of the needs of the population. The purpose of this paper is to explore the current state of affairs and to identify the factors that contribute to the gap between the current state of affairs and the needs of the population.

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