No. 590/O.E.C.D.

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

DAVID BROWN MODEL 780 SELECTAMATIC TRACTOR

Manufactured by: David Brown Tractors Ltd,
Meltham,
Huddersfield,
Yorkshire



Test No.: R.68/5509/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: 3rd January 1969 *Serial No.:* 258

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

TABLE OF CONTENTS

	PAGE	FIG.
Specification of tractor	4	
Fuels and lubricants used in tests	8	
Compulsory tests		
Power take-off	8	1
Drawbar	9	2, 3 and 4
Turning space and turning circle	11	
Location of centre of gravity	11	
Braking	11	
Noise measurement	12	
Power lift and hydraulic pump performance	12	
Repairs, adjustments and remarks	13	
Performance curves		1-4

SPECIFICATION OF TRACTOR

Manufacturer:	David Brown Tractors Ltd, Meltham, Huddersfield, Yorkshire
Submitted for test by:	The manufacturer
Selected by:	The manufacturer with the agreement of the testing station
Place of running-in:	Meltham
Duration of running-in:	50 hours

Tractor

Make:	David Brown Tractors Ltd, Meltham, Huddersfield, Yorkshire
Model:	780 Selectamatic
Type:	Four wheel, rear wheel driven
Serial No:	780/1600706

Engine

Make:	David Brown	Model:	355011
Type:	4-stroke, direct injection diesel	Serial No:	355011/2249
Cylinders:	3 cylinders, vertical, in-line, 3.939 in (100.1 mm) bore x 4.5 in (114.3 mm) stroke, capacity 164.5 in^3 (2.696 l), compression ratio 17:1, overhead in-line valves		
Fuel system:	AC-Delco type E/FP 63154-B mechanical type fuel feed pump with hand primer; C.A.V. type 2FS filters in series with replaceable paper elements, sediment bowl and gauze strainer on fuel feed pump; capacity of fuel tank 8 UKgal (36.37 l); C.A.V. type DPA 323 3000 injection pump, Serial No. 19103ZJ; manufacturer's production setting of injection pump 13.68 pt/h (7.77 l/h) to 14.20 pt/h (8.07 l/h) at 1600 rev/min engine speed; C.A.V. type BDLL 140S 6417 injector nozzles, injection pressure 175 atm (181 kg/cm^2)		
Governor:	C.A.V. mechanical, incorporated in fuel injection pump, governed range of engine speed 700-2375 rev/min, rated engine speed 1800 rev/min		
Air cleaner:	AC oil bath with centrifugal pre-cleaner above hood; oil capacity 1¼ pt (0.71 l)		
Lubrication system:	Forced feed from gear type pump with metal strainer in sump; Purolator full flow replaceable paper element oil filter type MF 22203; total oil capacity 11 pt (6.25 l), recommended oil change period 125 h		

Cooling system:	Water cooled, impeller assisted, with 14 in (356 mm) dia, 4 blade, belt driven fan, thermostat for temperature control, pressurized at 4 lb/in^2 (0.3 kg/cm^2), cooling water capacity 16 pt (9.09 l)
Starting system:	Electrical, 12V Lucas type M45G solenoid engaged starter motor operable only with clutch pedal fully depressed; retarding device on injection pump for cold starting
Electrical system	**Voltage:** 12, negative earth **Generator:** Lucas type C 40 A **Battery:** Exide type 6-TXMZ15L lead acid, capacity 96 Ah

Transmission

Clutch:	Borg and Beck dual dry clutch, two 10 in (254 mm) dia plates for gearbox and p.t.o. drives, pedal operated
Gearbox:	Own make, sliding gear type, 6 forward speeds and 2 reverse
Rear axle and final drive:	Own make, crown wheel and pinion, with differential and outboard spur gear final drives, pedal operated differential lock
Oil capacities:	Transmission 40 pt (22.7 l), final reduction units 2 pt (1.1 l) each; recommended oil change period 1000 h

Gear	Number of engine revolutions for 1 revolution of driving wheel	Nominal travelling speed at 1800 rev/min rated speed of engine, mile/h	(km/h)
Forward			
1	124.90	1.96	(3.15)
2	75.31	3.24	(5.21)
3	55.86	4.37	(7.03)
4	41.21	5.93	(9.54)
5	33.66	7.25	(11.67)
6	18.41	13.26	(21.34)
Reverse			
1	75.86	3.22	(5.18)
2	33.93	7.20	(11.58)

Power take-off

Main: At rear of tractor, 6-spline, $1\frac{3}{8}$ in (34.9 mm) dia, proportional engine speed; height above ground $23\frac{1}{4}$ in (591 mm); direction of rotation clockwise viewed from tractor rear

Low ratio: 532 rev/min at 1800 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1828 rev/min engine speed

High ratio: 900 rev/min at 1800 rev/min rated engine speed, 1000 rev/min at 2000 rev/min engine speed

Power lift: Own make, live hydraulic, gear pump in transmission housing supplying oil to ram cylinder and 2 external tappings; Category 1 implement linkage with top link sensing; draught, position and T.C.U. controls selected on single operating lever; vertical lift movement above ground: $8\frac{7}{8}$ in (225 mm) to $34\frac{1}{2}$ in (876 mm)

Drawbar

Swinging drawbar: Radius of swing $24\frac{1}{2}$ in (622 mm), height above ground to centre of clevis $12\frac{1}{4}$ in (311 mm) and $15\frac{5}{8}$ in (397 mm); distance from rear axle centre $28\frac{1}{2}$ in (724 mm); distance relative to p.t.o. shaft $13\frac{3}{4}$ in (349 mm) to rear; lateral adjustment $12\frac{1}{2}$ in (318 mm); pivot position relative to rear axle centre 4 in (102 mm) to rear; drawbar in transport position, height above ground to centre of clevis $15\frac{7}{8}$ in (403 mm), distance from rear axle centre 16 in (406 mm)

Linkage drawbar: Drawbar fixed on lower links, with central hole and 4, 13/16 in (21 mm) dia holes 2 in (51 mm) apart either side of centre line, vertical adjustment from $9\frac{1}{8}$ in (244 mm) to $34\frac{3}{4}$ in (883 mm) changed by adjusting height of lower links, hydraulically locked

Steering: Recirculating ball and nut with single drop arm and drag link

Brakes: Internal expanding drum brakes on spur pinion shafts, independent or combined, pedal operated; hand lever with ratchet operating both brakes for parking

Wheels

Steering wheels: Two at front, Goodyear Super Rib 6.00 - 16 tyres, 4 ply rating, maximum permissible weight on each tyre 990 lb (449 kg) at 32 lb/in^2 (2.2 kg/cm^2) pressure; 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, Goodyear Traction Sure Grip 11 - 28 tyres, 4 ply rating, mounted on W11 rims; maximum permissible weight on each tyre 2070 lb (939 kg) at 14 lb/in^2 (0.98 kg/cm^2) pressure; track width 48½ in (1232 mm) by 4 in (102 mm) steps, to 76½ in (1943 mm), changed by reversing wheel centres and offset lug type rims
Wheelbase:	6 ft 3 13/16 in (1926 mm)

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

Weight without ballast

Front:	1335 lb (606 kg)
Rear:	2376 lb (1078 kg)
Total:	3711 lb (1683 kg)

Ballast

Front:	3 frame weights and frame, total 226 lb (103 kg) 1 weight per wheel, total 202 lb (92 kg)
Rear:	6 weights per wheel, total 1233 lb (559 kg) Water, total 588 lb (267 kg)

Weight with full ballast

Front:	1821 lb (826 kg)
Rear:	4139 lb (1877 kg)
Total:	5960 lb (2703 kg)

Seat	Bostrom, upholstered cushion and backrest, torsional rubber suspension adjustable for driver's weight; range of adjustment 3 in (76.2 mm) fore and aft

Number of grease points

Whole tractor:	25

Overall dimensions

Overall length:	Without front weights 10 ft 7 in (3.23 m) With front weights 11 ft 1 in (3.38 m)
Overall width:	Without ballast weights 5 ft 5⅛ in (1.65 m) at 52½ in (1334 mm) rear wheel track With ballast weights 6 ft 10 in (2.08 m) at 52½ in (1334 mm) rear wheel track
Overall height:	To top of exhaust pipe 6 ft 11 in (2.11 m) To top of steering wheel 4 ft 7½ in (1.41 m)
Minimum ground clearance:	To underside of drawbar frame 12¾ in (324 mm)

Lighting

	Height above ground of centre, in	(cm)	Diameter, in	(cm)	Distance from outside edge of tractor at 52½ in (1334 mm) wheel track, to centre, in	(cm)
Headlights	33½	(85)	4⅞	(12.4)	19⅞	(50)
Side lights	51½	(131)	2	(5.1)	12⅞	(33)
Rear lights	51½	(131)	2	(5.1)	12⅞	(33)
Reflectors	34	(86)	1½	(3.8)	18	(46)

Unrestricted beam angle of headlight in plan view 108°

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 drive reduction oil:	Shell 140 EP

COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 12th and 13th June 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					
42.9 (43.5)	2302	680	2.19 (9.96)	0.431 (193)	19.6 (4.37)
Standard p.t.o. speed (540 rev/min)					
37.2 (37.7)	1828	540	1.77 (8.05)	0.402 (180)	21.0 (4.69)
Standard belt speed					
Not applicable					
Speed recommended by the manufacturer for drawbar work					
36.9 (37.4)	1800	532	1.75 (7.96)	0.401 (179)	21.1 (4.71)
Fuel consumption at part loads					
37.3 (37.8)	2350	694	1.93 (8.77)	0.438 (196)	19.3 (4.31)
0	2370	700	0.56 (2.55)	-	-
18.6 (18.9)	2352	695	1.17 (5.32)	0.532 (238)	15.9 (3.55)
42.9 (43.5)	2302	680	2.19 (9.96)	0.431 (193)	19.6 (4.37)
9.3 (9.4)	2353	695	0.85 (3.86)	0.768 (344)	11.0 (2.45)
28.0 (28.4)	2351	694	1.52 (6.91)	0.458 (205)	18.4 (4.11)

No load, maximum engine speed: 2370 rev/min

Equivalent crankshaft torque at maximum power: 98.0 lb ft (13.6 kg m)

Maximum equivalent crankshaft torque: 110.1 lb ft (15.2 kg m) at 1500 rev/min engine speed

Mean atmospheric conditions:

temperature	76°F (24°C)
pressure	30.00 in Hg (762 mm Hg)
relative humidity	38%

Maximum temperature:

coolant	179°F (82°C)
engine oil	201°F (94°C)
fuel	108°F (42°C)

The following results were obtained with the p.t.o. in high ratio:

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					
43.7 (44.3)	2300	1150	2.21 (10.05)	0.428 (191)	19.8 (4.42)
Standard p.t.o. speed (1000 rev/min)					
40.3 (40.9)	2000	1000	1.95 (8.86)	0.410 (183)	20.6 (4.60)

2. DRAWBAR PERFORMANCE

Date of tests: 5th - 19th July 1968

Type of track: Tarmacadam

Height of drawbar above ground: $18\frac{3}{8}$ in (467 mm)

See table on page 10

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)	Specific fuel consumption, drawbar hp h/UKgal (metric drawbar hp h/l)	Temperature, °F (°C) Coolant	Fuel	Engine oil	Atmospheric conditions Temperature, °F (°C)	Relative humidity, %	Pressure, in Hg (mm Hg)
(i)	Maximum power (ballasted)												
1	*26.4 (26.8)	4700 (2132)	2.11 (3.39)	2316	15.0	0.601 (269)	14.1 (3.15)	176 (80)	82 (28)	157 (69)	65 (18)	61	29.66 (753)
2	34.4 (34.9)	3500 (1588)	3.69 (5.94)	2282	9.7	0.552 (247)	15.3 (3.41)	179 (82)	86 (30)	162 (72)	61 (16)	73	29.66 (753)
3	35.3 (35.8)	2600 (1179)	5.09 (8.19)	2275	7.0	0.535 (239)	15.8 (3.52)	179 (82)	92 (33)	170 (77)	63 (17)	69	29.63 (753)
4	35.7 (36.2)	1900 (862)	7.05 (11.34)	2268	5.0	0.523 (234)	16.2 (3.61)	179 (82)	92 (33)	161 (72)	63 (17)	69	29.63 (753)
5	35.2 (35.7)	1480 (671)	8.93 (14.37)	2313	4.0	0.535 (239)	15.8 (3.52)	178 (81)	92 (33)	159 (71)	68 (20)	80	29.63 (753)
(ii)	Five hour test at 75% pull at maximum power												
3	27.0 (27.4)	1950 (885)	5.19 (8.35)	2310	5.2	0.576 (258)	14.7 (3.28)	180 (82)	91 (33)	185 (85)	64 (18)	74	29.67 (754)
(iii)	+Five hour test at pull corresponding to 15% wheelslip in test (i)												
1	-	4700 (2132)	2.19 (3.52)	-	-	-	-	178 (81)	91 (33)	183 (84)	63 (17)	64	29.67 (754)
(iv)	Maximum power (unballasted)												
1	*21.4 (21.7)	3750 (1701)	2.14 (3.44)	2306	15.0	-	-	175 (79)	-	185 (85)	69 (21)	55	30.22 (768)
2	34.1 (34.6)	3700 (1678)	3.40 (5.57)	2248	14.2	-	-	180 (82)	-	190 (88)	69 (21)	59	30.22 (768)
3	37.0 (37.5)	2750 (1247)	5.05 (8.13)	2250	7.6	-	-	180 (82)	-	170 (77)	68 (20)	58	30.22 (768)
4	38.2 (38.7)	2000 (907)	7.16 (11.52)	2304	4.9	-	-	179 (82)	-	165 (74)	71 (22)	56	30.22 (768)
5	38.9 (39.4)	1625 (737)	8.97 (14.43)	2313	3.7	-	-	180 (82)	-	160 (71)	64 (18)	70	30.22 (768)

Total oil consumption during ten hours duration of tests (ii) and (iii) 0.003 lb/h (1.4 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 - 52½ in (1334 mm)

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space	10 ft 2 in (3.10 m)	10 ft 4 in (3.15 m)	11 ft 4½ in (3.47 m)	11 ft 4½ in (3.47 m)
Radius of turning circle	9 ft 10 in (3.00 m)	10 ft 0½ in (3.06 m)	11 ft 2 in (3.40 m)	11 ft 2 in (3.40 m)

5. LOCATION OF CENTRE OF GRAVITY

Height above ground	28.1 in (714 mm)
Distance forward from the vertical plane containing the axis of the rear wheels	26.1 in (663 mm)
Distance from the median plane of the tractor	0

6. BRAKING

Date of tests: 18th July 1968

Type of track: Tarmacadam

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)	16.1	(4.9)	15.6	(4.8)
Stopping distance, ft (m)	20.4	(6.2)	23.0	(7.0)
Force on brake pedal, lb (kg)	140	(64)	200	(91)

Brake fade characteristics (hot tests)

Maximum deceleration hot/maximum deceleration cold x 100:	100%
Stopping distance cold/stopping distance hot x 100:	94%
Force on pedal cold/force on pedal hot x 100:	96%
Efficiency of handbrake:	Satisfactory
Pull on handbrake:	Not applicable - lock for brake pedals

7. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	19th August 1968	
Type of sound level meter:	Brüel and Kjoer Type 2203	
Type of track:	Tarmacadam	
Results of tests:	gear	6th
	travelling speed before acceleration	12.8 mile/h (20.6 km/h)
	sound level	87 dBA

8. NOISE MEASUREMENTS AT THE DRIVER'S EAR LEVEL

Date of tests:	19th August 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
2	3.81 (6.13)	130
3	5.17 (8.32)	105

9. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 18th and 19th June 1968; N.I.A.E., Silsoe, Bedford, U.K.

Hydraulic fluid

Make and type:	Shell Tractor Oil Universal
Viscosity:	20W/30
Viscosity index:	105

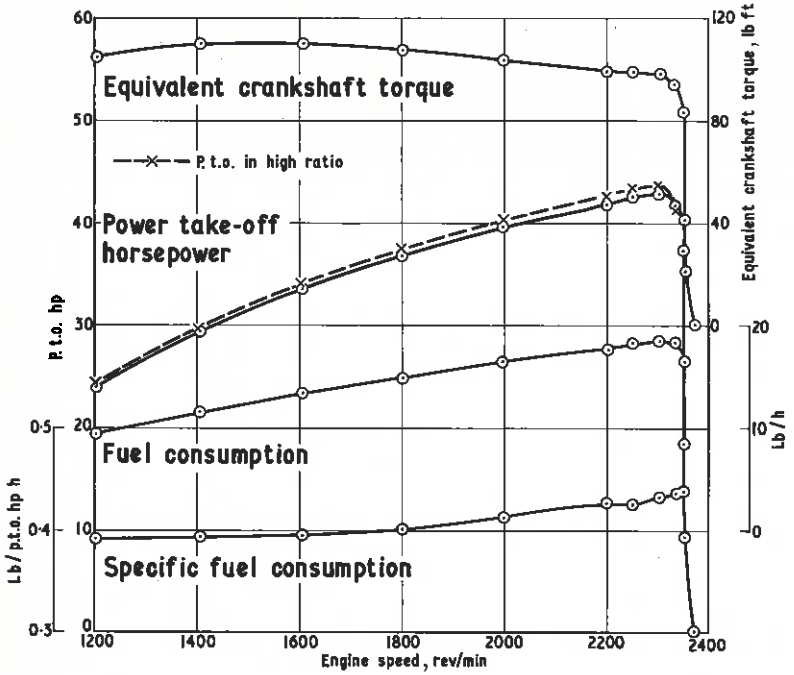
	Vertical movement, in (mm)	Maximum force exerted through full range, lb (kg)	Pressure, lb/in^2 (kg/cm^2)	Linkage load at which unballasted front end of tractor lifts off the ground, lb (kg)
Linkage giving maximum mechanical advantage				
At lower hitch points (height above ground in down position $8\frac{7}{8}$ in (225 mm))	$25\frac{5}{8}$ (651)	2880 (1306)	2600 (183)	2150 (975)
On the frame (24 in (610 mm) to rear of lower hitch points)	30 9/16 (776)	1810 (821)	2600 (183)	1545 (701)

Type of linkage lock for transport:	Mechanical	
Opening pressure of the cylinder over pressure relief valve (manufacturer's figures):	2600 lb/in^2	(183 kg/cm^2)
Pump characteristics		
i) opening pressure of relief valve:	2000 lb/in^2	(141 kg/cm^2)
sustained pressure of the open relief valve:	2350 lb/in^2	(165 kg/cm^2)
Pump delivery rate at external tapping		
ii) at minimum pressure (rated engine speed):	5.00 gal/min	(22.7 l/min)
iii) at maximum hydraulic power:	6.04 gal/min	(27.5 l/min)
delivery pressure:	2000 lb/in^2	(141 kg/cm^2)
power:	8.46 hp	(8.58 metric hp)
15. REPAIRS AND ADJUSTMENTS DURING TEST	None	
REMARKS	None	

Officer in charge: D.W. SMITH

Head of Testing Division: T.C.D. MANBY

Date: 20th November 1968



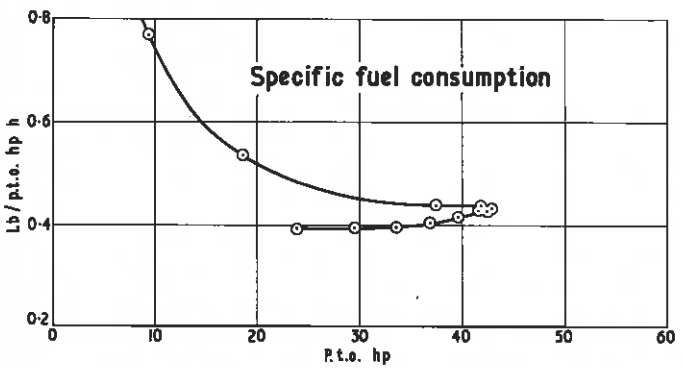


Fig.1. Power take-off test

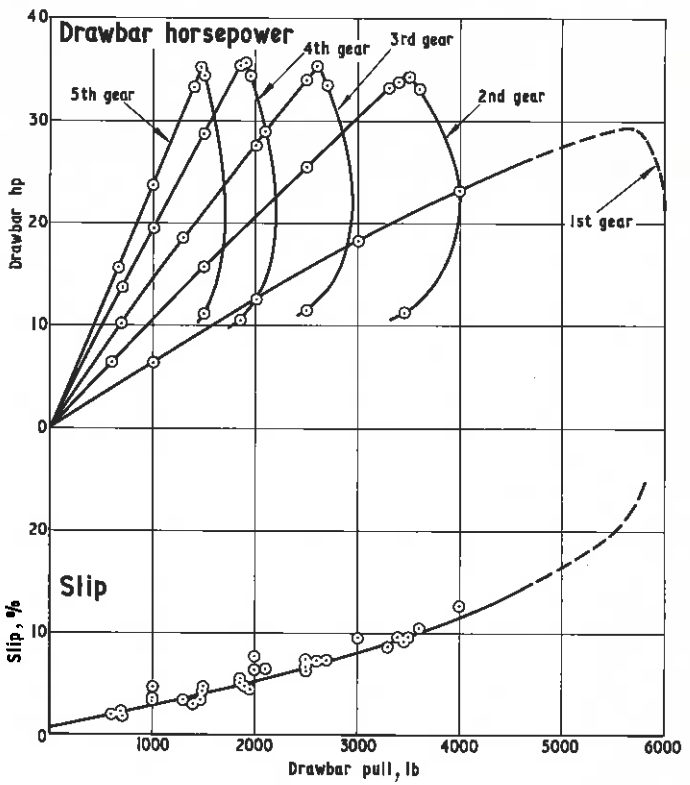


Fig.2. Drawbar test on tarmacadam, with ballast

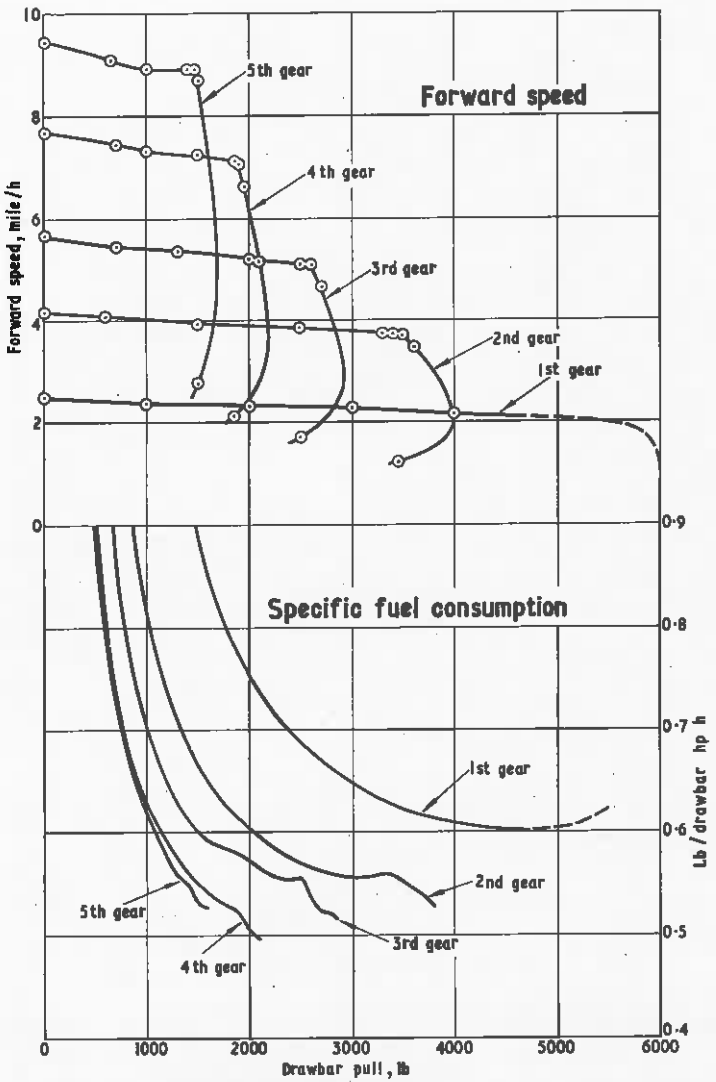


Fig. 3. Drawbar test on tarmacadam, with ballast

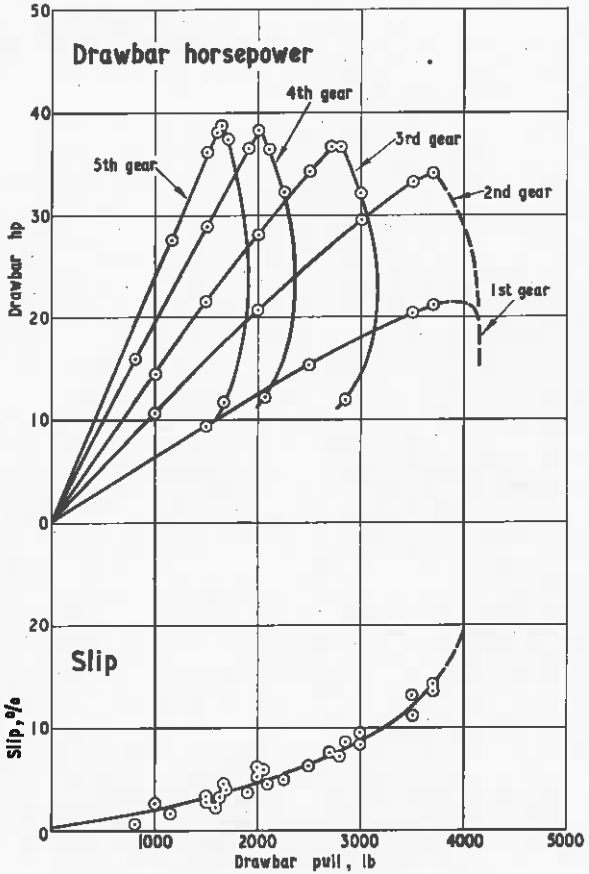


Fig. 4. Drawbar test on tarmacadam, without ballast

Copyright, The British Society for Research in Agricultural Engineering

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