No. 336/O.E.C.D.

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

ALLIS-CHALMERS MODEL ED40 DIESEL TRACTOR

Manufactured by: Allis-Chalmers (Great Britain) Limited,
Essendine, Stamford, Lincs.



Date of Tests: May/June 1962
Test No.: R.62062/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: 6th March 1963 *Serial No.:* 033

The British Society for Research in Agricultural Engineering
NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING
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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 1

SPECIFICATION OF TRACTOR

Tractor:

Make:	Allis-Chalmers
Model:	ED40 diesel
No:	Serial No. ED 2498

Engine:

Make:	Standard Triumph Engineering Ltd, type 23C indirect injection diesel, Serial No. LSD 4480E
Cylinders:	4 cylinders, vertical, in-line, $3\frac{5}{16}$ in. (84·1 mm) bore × 4 in. (101·6 mm) stroke, compression ratio 20:1, replaceable dry cylinder liners, overhead valves
Rated speeds:	2000 rev/min, governor setting—no load engine speed 2115 rev/min
Minimum speed:	(For full load work). Not specified
Fuel system:	Fuel—diesel oil C.A.V. type DPA 3243390 injection pump, Serial No. R.49880D; C.A.V. Pintaux type injector nozzles. Manufacturer's production setting for injection pump: 7·1 ml to 7·3 ml per cylinder for 200 strokes of pump at 800 rev/min pump speed (bench test figures). Injection pressure 135 atm (139 kp/sq. cm). A.C. fuel tap and sediment bowl on tank, A.C. type YJ fuel feed pump and one C.A.V. type F4B1 fuel filter on pressure side of feed pump. Capacity of fuel tank: $11\frac{1}{2}$ UKgal (52·3 l)
Governor:	C.A.V. mechanical incorporated in injection pump. Governed range of engine speed 650 rev/min to 2115 rev/min
Air cleaner:	A.C. oil bath with centrifugal pre-cleaner outside hood. Oil capacity 1 pt (0·57 l)
Oiling system:	Forced feed from Eaton type pump, S.A.E. 20 oil. Purolator cartridge type full flow filter. Recommended oil change period, 120 h. Oil capacity, engine sump 12 pt (6·8 l)
Cooling system:	Pressurised water cooled, 7 lb/sq. in. (0·49 kp/sq. cm), impeller assisted with $13\frac{1}{2}$ in. (343 mm) dia 6-blade belt driven fan, thermostat for temperature control. Cooling water capacity 17 pt (9·7 l)

Transmission:

Clutch:	Borg and Beck 10 in. (254 mm) dia, single plate, dry, foot-pedal operated
Gearbox:	Own make sliding gear and constant mesh type, 8 forward speeds and 2 reverse
Differential:	Final drive with crown wheel and pinion with differential and spur gears, no differential lock fitted. Auxiliary hand operated clutch on right-hand differential half shaft. Transmission oil capacities: transmission case 16 pt (9·1 l), final drives $1\frac{1}{2}$ pt (0·9 l) each

Gear No.	*Number of engine revolutions for one revolution of driving wheel*	*Theoretical travelling speed for 2000 rev/min rated speed of engine, mile/h (km/h)*
1	240·0	1·21 (1·95)
2	119·0	2·44 (3·93)
3	116·0	2·50 (4·02)
4	91·0	3·19 (5·13)
5	57·5	5·05 (8·13)
6	45·0	6·45 (10·38)
7	36·0	8·07 (12·98)
8	17·8	16·31 (26·24)
R. Low	116·0	2·50 (4·02)
R. High	57·5	5·05 (8·13)

Steering device:	Worm and peg type with single drag link
Brakes:	Hand brake—not fitted Foot brakes—contracting shoe type on differential half shafts, independent or combined foot-pedal operated, latch on foot-pedals for parking

Wheels:

Steering wheels:	Two at front. Tyres, 6·00–16, 4 ply pneumatic. Track 48 in. (1219 mm) by 4 in. (102 mm) steps to 72 in. (1829 mm), changed by extending front axle and reversing wheels. Maximum permissible weight on each tyre 915 lb (415 kg) at 28 lb/sq. in. (2·0 kp/sq. cm), 990 lb (449 kg) at 32 lb/sq. in. (2·2 kp/sq. cm)
Driving wheels:	Two at rear. Tyres, 13–28, 6 ply pneumatic. Track 56 in. (1422 mm) by 4 in. (102 mm) steps to 72 in. (1829 mm), changed by reversing wheel centres and offset lugs on rims. Maximum permissible weight on each tyre 2630 lb (1193 kg) at 12 lb/sq. in. (0·8 kp/sq. cm), 3320 lb (1506 kg) at 18 lb/sq. in. (1·3 kp/sq. cm)
Wheelbase:	6 ft 4½ in. (1943 mm)

Belt pulley:	Not fitted for test
Location:	At rear of tractor in three alternative positions, p.t.o. driven
Diameter × width:	10 in. (254 mm) × 5½ in. (140 mm)
Speeds:	1158 rev/min giving 3032 ft/min (15·4 m/s) linear speed at 2000 rev/min rated engine speed
Direction of rotation:	Optional, related to position of unit

Power take-off

Main:	6 spline, 1⅜ in. (34·9 mm) dia, at rear of tractor, not independent of main clutch, live p.t.o. provided by auxiliary hand clutch on right-hand differential half-shaft
Height above ground:	26⅜ in. (670 mm)
Speeds:	643 rev/min at 2000 rev/min rated engine speed 540 rev/min at 1680 rev/min engine speed
Direction of rotation:	Clockwise viewed from tractor rear

Power lift:	Live hydraulic, gear pump driven from front of engine crankshaft supplying oil at 2500 lb/sq. in. (176 kp/sq. cm) to single acting ram cylinder, oil capacity 26 pt (14·8 l). Category I and II implement linkage with reversible lower links, mechanical depth control and hydraulic weight transfer system. Maximum load at end of lower links—manufacturer's recommended figures: 2000 lb (907 kp)—test figures: 2300 lb (1043 kp) at 2450 lb/sq. in. (172 kp/sq. cm) oil pressure with lower links horizontal. Oil delivery at 2000 rev/min engine speed: 5 UKgal/min (22·7 l/min) at 2500 lb/sq. in. (176 kp/sq. cm)
Drawbars:	Swinging drawbar—standard, lateral adjustment 17⅛ in. (448 mm), no vertical adjustment, height above ground 20⅞ in. (530 mm), distance from rear axle 22 in. (559 mm) to rear—S.A.E. as used for test, lateral adjustment 25 in. (635 mm), no vertical adjustment, height above ground 18¼ in. (464 mm), distance from rear axle 28⅝ in. (727 mm) to rear
Hitch:	None fitted

Electrical equipment:

Voltage:	12
Generator:	Lucas type C 39P2
Batteries:	Two 6V Exide type 3-XNZ 19L lead-acid in series, capacity 130 amp h
Starting device:	Lucas 12V solenoid engaged starter motor, one C.A.V. heater plug per cylinder for cold starting

Overall dimensions:

Overall length:	10 ft $1\frac{3}{8}$ in. (3·08 m) as tested
Overall width:	5 ft $11\frac{1}{4}$ in. (1·81 m) at 56 in. (1422 mm) track, no ballast weights. 7 ft 9 in. (2·36 m) at 56 in. (1422 mm) track, to outside of wheel weights, 11 per wheel
Overall height:	5 ft $10\frac{1}{4}$ in. (1·78 m) to top of exhaust pipe 5 ft $1\frac{1}{4}$ in. (1·56 m) to top of steering wheel
Minimum ground clearance:	$17\frac{5}{8}$ in. (448 mm) to bottom of S.A.E. drawbar

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

	Without additional weight, lb (kg)	*With maximum additional weight, lb (kg)*
On front wheels	1386 (629)	1807 (820)
On rear wheels	2328 (1056)	4940 (2241)
Total	3714 (1685)	6747 (3060)

Special Remarks: None

PART II
LABORATORY TESTS

1. **Compulsory tests:** Power take-off test

Date and location of tests: 31st May 1962; N.I.A.E., Silsoe, Beds., U.K.

Type of dynamometer: Water brake, Heenan and Froude

Fuel: Diesel oil, density 0·845 at 60°F (15·6°C), Cetane No. 51

Oil: S.A.E. 20

(1) *Sustained power tests:*

Duration of test, h	*Horse-power (Metric h.p.)*	*Engine speed, rev/min*	*Torque, lb ft (kpm)*	*Specific fuel consumption, lb/h.p. h (g/metric h.p. h)*	*Fuel temp, °F (°C)*	*Oil temp, °F (°C)*	*Coolant temp, °F (°C)*	*Air temp, °F (°C)*	*Atmos. pressure, in. Hg (mm Hg)*	*Remarks*
2	34·6 (35·1)	2022	89·8 (12·4)	0·479 (214)	77 (25)	173 (78)	180 (82)	70 (21)	30·09 (764)	Max. power
1	21·6 (21·9)	1216	93·4 (12·9)	0·454 (203)	80 (27)	160 (71)	179 (82)	64 (18)	30·09 (764)	At 85% of engine speed at max. torque

(2) *Varying speed tests:*

Horse-power (Metric h.p.)	*Engine speed, rev/min*	*Fuel consumption*			*Temperature*			*Atmos. conditions*		*Remarks*
		UK gal/h (l/h)	*H.p. h/ UKgal (metric h.p.h/l)*	*Lb/h.p. h (g/metric h.p. h)*	*Oil, °F (°C)*	*Coolant, °F (°C)*	*Fuel, °F (°C)*	*Temp, °F (°C)*	*Pressure, in. Hg (mm Hg)*	
34·4 (34·9)	2000	1·95 (8·9)	17·7 (3·95)	0·478 (214)	174 (79)	178 (81)	77 (25)	65 (18)	30·09 (764)	Rated engine speed
30·0 (30·4)	1680	1·67 (7·6)	17·9 (3·99)	0·472 (211)	172 (78)	180 (82)	78 (26)	66 (19)	30·09 (764)	P.t.o. speed 540 rev/min
0	2115	0·54 (2·5)	—	—	171 (77)	160 (71)	72 (22)	61 (16)	30·09 (764)	No load

PART III

DRAWBAR TESTS ON ARTIFICIAL TRACK

Date of tests:	18th-27th June 1962
Type of track:	Tarmacadam
Position of governor control lever:	Fully open giving no load engine speed of 2115 rev/min
Type of tyre:	Rear—Goodyear, Traction Sure Grip, straight bar open centre, 13–28, 6-ply pneumatic Front—Goodyear, Super Rib, 6·00–16, 4-ply pneumatic
Fuel:	Diesel oil density 0·845 at 60 °F (15·6 °C), Cetane No. 51
Oil:	S.A.E. 20 engine EP 80 transmission

A. Tests with maximum additional weight

Weight of tractor, without driver:

Weight without ballast:	Front—1386 lb (629 kg), rear—2328 lb (1056 kg)
Ballast: front	Weights, 2 per wheel—234 lb (106 kg) Water—97 lb (44 kg)
rear	Weights, 11 per wheel—1733 lb (786 kg) Water—879 lb (399 kg)
Weight with full ballast:	Front—1807 lb (820 kg), rear—4940 lb (2241 kg) Total—6747 lb (3060 kg)
Tyre pressure:	Front—28 lb/sq. in. (2·0 kp/sq. cm) Rear—12 lb/sq. in. (0·8 kp/sq. cm)
Height of drawbar above ground:	17 in. (432 mm)

(1) *Maximum powers and pulls*

Gear No.	Maximum powers						Air temp, °F (°C)	Atmos. press, in. Hg (mm Hg)	Maximum pulls	
	Horse-power (Metric h.p.)	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
1	17·3 **(17·5)**	6350 **(2880)**	18·1	2052	1·02 **(1·64)**	167 **(75)**	71 **(22)**	29·81 **(757)**	6600 **(2994)**	Wheelspin
2	28·9 (29·3)	4800 (2177)	9·1	2010	2·26 (3·64)	174 (79)	65 (18)	29·65 (753)	5250 (2381)	Engine stall
3	29·1 (29·5)	4700 (2132)	8·7	2014	2·32 (3·73)	171 (77)	64 (18)	29·56 (751)	5100 (2313)	Engine stall
4	29·3 (29·7)	3600 (1633)	6·3	2030	3·05 (4·91)	172 (78)	72 (22)	29·57 (751)	4000 (1814)	Engine stall
5	30·0 (30·4)	2250 (1021)	3·5	2027	5·00 (8·05)	168 (76)	72 (22)	29·57 (751)	2550 (1157)	Engine stall
6	29·1 (29·5)	1700 (771)	2·5	2009	6·42 (10·33)	169 (76)	65 (18)	29·56 (751)	1975 (896)	Engine stall
7	27·8 (28·2)	1300 (590)	1·9	2000	8·02 (12·90)	166 (74)	68 (20)	29·56 (751)	1500 (680)	Engine stall

(2) *Fuel consumption*

Gear No.	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/h.p. h (g/metric h.p. h)	Drawbar h.p. h/ UKgal (drawbar metric h.p. h/l)	Corresponding pull, lb (kp)	
1	0·657 (294)	12·9 (2·88)	5550 (2517)	3800 – > 6350 (1724) (2880)
2	0·575 (257)	14·7 (3·28)	4800 (2177)	2390 – 5250 (M.S.P.) (1084) (2381)
3	0·572 (256)	14·8 (3·30)	4700 (2132)	2490 – 5100 (M.S.P.) (1129) (2313)
4	0·570 (255)	14·8 (3·30)	3600 (1633)	1830 – 4000 (M.S.P.) (830) (1814)
5	0·560 (250)	15·1 (3·37)	2250 (1021)	1440 – 2550 (M.S.P.) (653) (1157)
6	0·568 (254)	14·9 (3·32)	1700 (771)	1070 – 1975 (M.S.P.) (485) (896)
7	0·604 (270)	14·0 (3·12)	1300 (590)	950 – 1500 (M.S.P.) (431) (680)

B. **Tests without ballast**

Weight of tractor without driver:

Weight without ballast:	Front—1386 lb (629 kg), rear—2328 lb (1056 kg) Total—3714 lb (1685 kg)
Tyre pressure:	Front—20 lb/sq. in. (1·4 kp/sq. cm) Rear—12 lb/sq. in. (0·8 kp/sq. cm)
Height of drawbar above ground:	18¼ in. (464 mm)

(1) *Maximum powers and pulls:*

Gear No.	*Maximum powers*						*Air temp, °F (°C)*	*Atmos. press, in. Hg (mm Hg)*	*Maximum pulls*	
	Horse-power (Metric h.p.)	*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*
4	26·9 (27·3)	3500 (1588)	13·5	2026	2·88 (4·63)	167 (75)	63 (17)	30·04 (763)	3800 (1724)	Wheelspin
5	30·1 (30·5)	2300 (1043)	6·4	2021	4·91 (7·90)	168 (76)	61 (16)	30·04 (763)	2600 (1179)	Engine stall
6	29·7 (30·1)	1750 (794)	4·7	2014	6·36 (10·23)	171 (77)	62 (17)	30·04 (763)	2000 (907)	Engine stall
7	28·0 (28·4)	1330 (603)	3·5	2000	7·89 (12·70)	170 (77)	64 (18)	30·04 (763)	1500 (680)	Engine stall

PART IV

1. **Location of centre of gravity:**

	Test A, ballasted	*Test B, unballasted*
Height above ground	28·8 in. (731 mm)	33·8 in. (859 mm)
Distance forward from the vertical plane containing the axis of the rear wheels	20·0 in. (508 mm)	27·3 in. (693 mm)
Distance from the median plane parallel to the longitudinal axis of the tractor bisecting the track	0	0

2. **Turning space and turning radius:**

Wheel equipment: As for drawbar tests without ballast
Wheel track: 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 10 in. (3·3 m)	11 ft 0 in. (3·4 m)	12 ft 0 in. (3·7 m)	12 ft 4 in. (3·8 m)
Turning radius	10 ft 5 in. (3·2 m)	10 ft 7 in. (3·2 m)	11 ft 7 in. (3·5 m)	11 ft 11 in. (3·6 m)

PART V

Repairs and adjustments during tests: None

Remarks:

1. The steering was very light when developing maximum sustained pull in 1st gear and additional front weights up to the tyre limit [a further 173 lb (78 kg)] would be advisable with the ballasted tractor
2. The parking brake latch was difficult to engage when the brake linkage was fully adjusted; it was also liable to release due to vibration when the tractor was parked with the engine running and to shake 'on' when the tractor was driven over rough ground (*Ref. 1*)
3. The track rod had no marks to facilitate front wheel alignment when changing the track (*Ref. 2*)

Test Engineers: M. W. JESSON
D. W. SMITH

Head of Tractor Performance Department: T. C. D. MANBY

Date: 7th January 1963

The manufacturers state that:

Ref. 1. A hand brake, of the ratchet engagement type, is now offered as alternative equipment to replace the parking brake latch.

Ref. 2. The design of the track rod has now been modified to include markings which will indicate the correct placing of the tie rod to match the various axle widths.

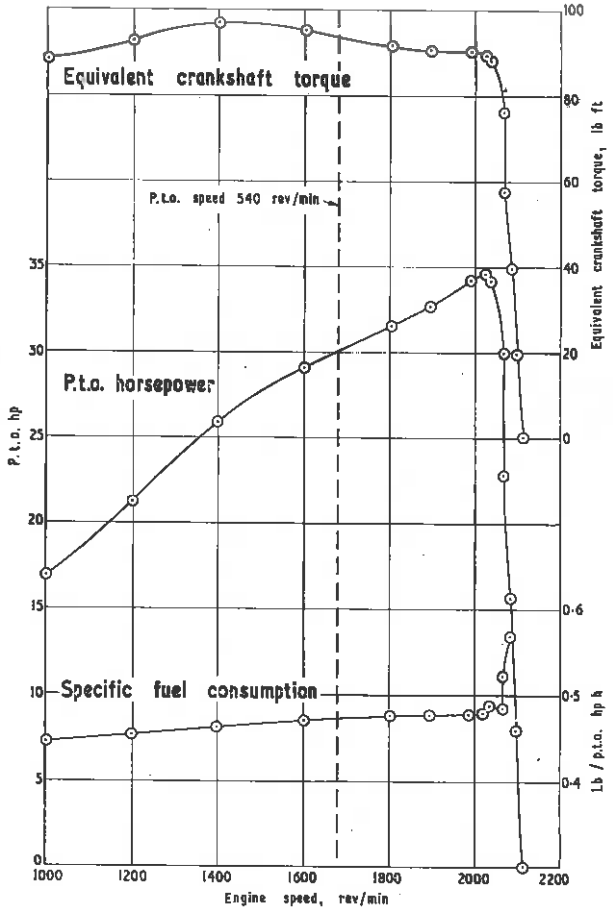


FIG. 1. Power take-off test

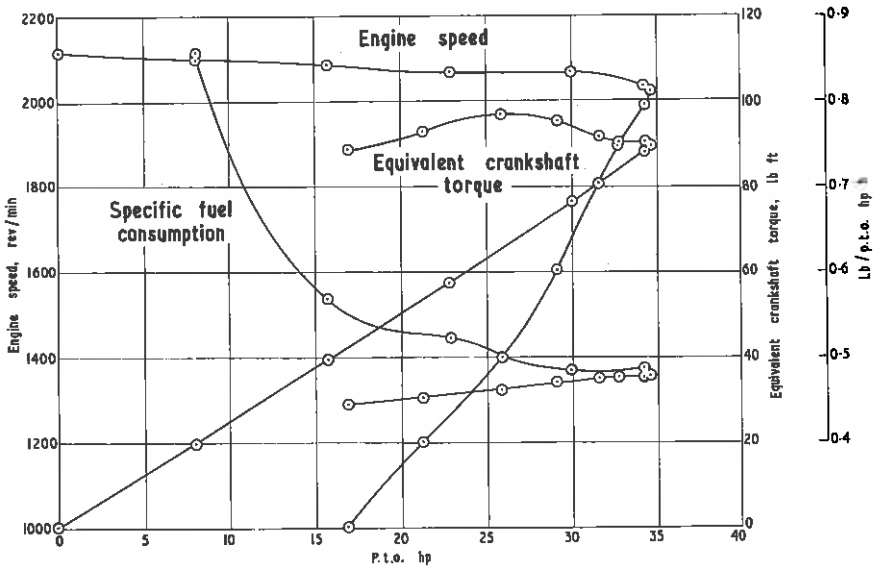


FIG. 2. Power take-off test

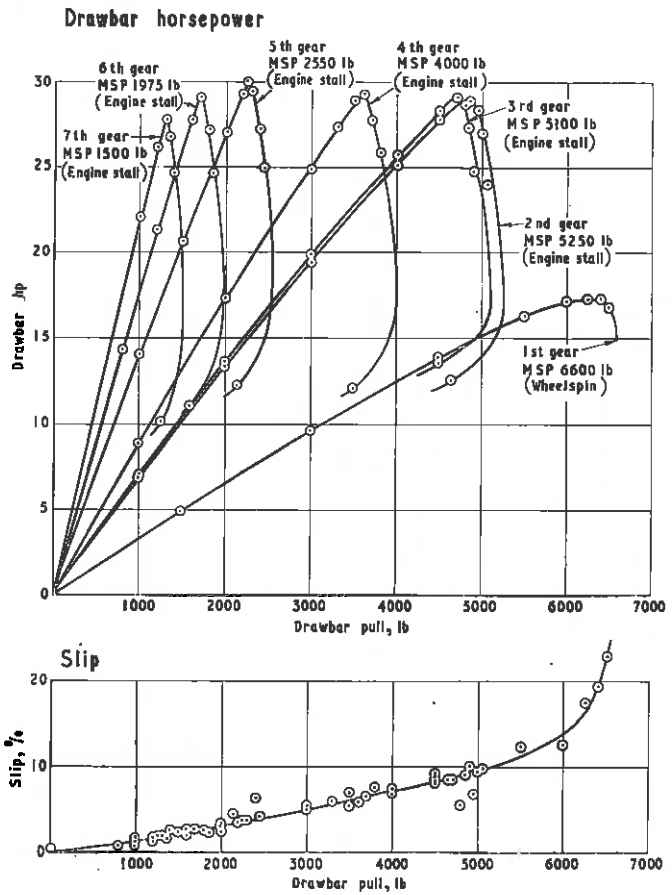


FIG. 3. Drawbar test on tarmacadam, with ballast

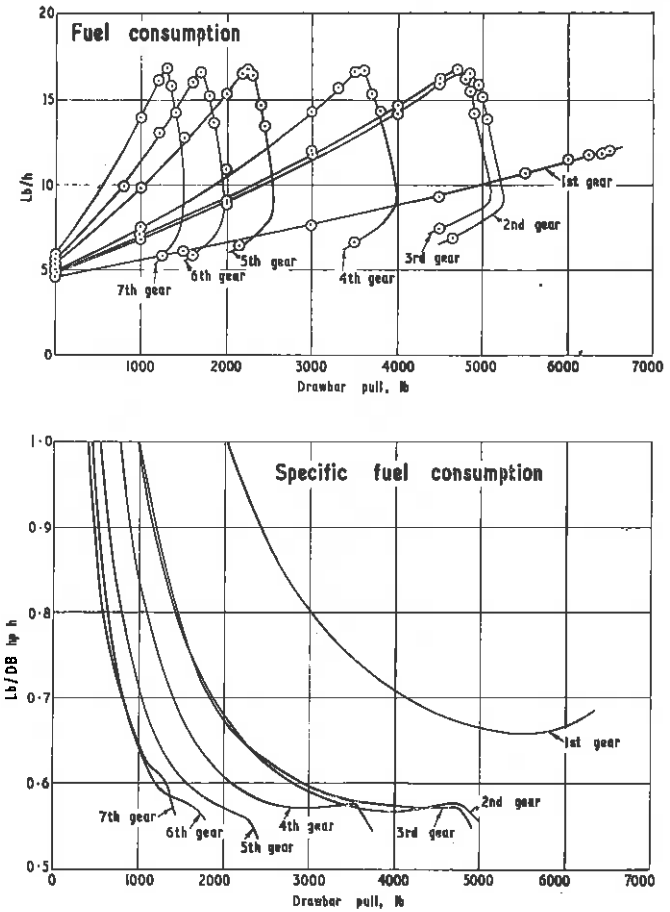


FIG. 4. Drawbar test on tarmacadam, with ballast

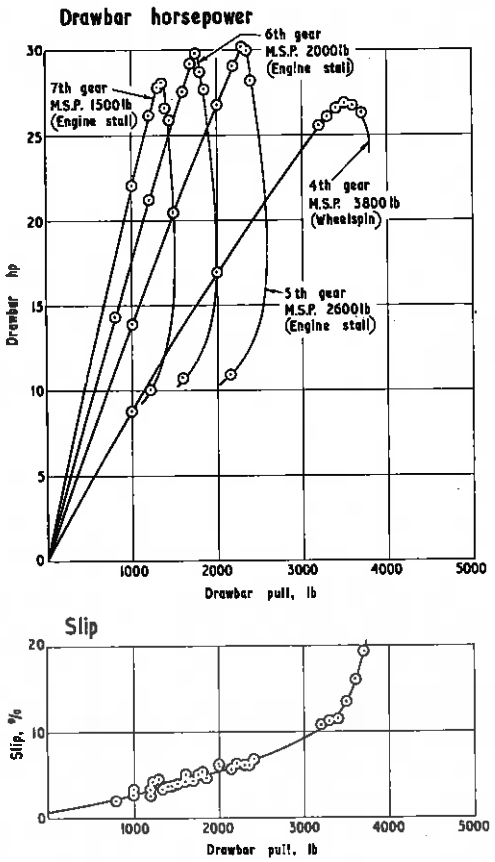


FIG. 5. Drawbar test on tarmacadam, without ballast

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